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Research Consortium

Background Papers
for

Report of the Task Force on
The Aggregate Measure of Support:
Potential Use by GATT for Agriculture*

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FOREWORD

This collection of papers was developed in support of an IATRC task force report on the possible applications of an aggregate measure of support (AMS) to negotiating policy reform in the Uruguay Round. The task force report is published separately by the IATRC as "Bringing Agriculture into the GATT: Potential Use of an Aggregate Measure of Support."

The Task force draws on this collection to illustrate or emphasize certain points related to how well the AMs measures or captures the effects of particular policies or policy changes. The task force felt that including these examples in their entirety would make the final report overly long and technical for a policymaker audience. It also thought, however, that they would be of sufficient interest to an academic audience to warrant their joint publication as an IATRC Working Paper. The executive summary of the task force report is also included in this document.

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THE AGGREGATE MEASURE OF SUPPORT: POTENTIAL USE BY GATT FOR AGRICULTURE

Executive Summary

The Uruguay Round differs from past Rounds in its recognition that trade problems have their roots in a wide range of domestic as well as trade policy instruments. This recognition signalled the need for a measurement device that would tell us considerably more about government intervention in agriculture than we learn from tariffs or simple nominal protection coefficients, but that would require considerably less information than that needed by many economic models. Extensive work at the OECD on producer subsidy equivalents (PSE's) encouraged negotiators to find a formal role in the negotiations for an aggregate index of this type. Criticisms of the PSE (as we know it) produced suggestions that there might be some other aggregate measure of support (AMS) more suitable to be cast as an instrument of negotiation. As the Round has progressed, there has been very little disagreement over the need for some AMS, but relatively little agreement over what its explicit role or key characteristics should be. Indeed, different roles may well call for different characteristics.

The use of an AMS as a negotiating device suggests a package approach to policy reform or, at a minimum, an interest on the part of negotiators in the full range of policy instruments affecting agricultural markets. This is a marked addition to past practice and complements the traditional request and offer approach and efforts to write rules strictly regulating particular policy instruments. The AMS approach offers the possibility of broad based, across-the-board policy reform that avoids misinformation and special interest group domination and, at the same time, offers countries flexibility in their choice of approaches to reform. (Flexibility is greater the larger the policy set included in the AMS). The strength of an AMS approach is its flexibility. Its greatest potential weaknesses are (1) particularly egregious policy instruments may remain in place and (2) policy switching could, in theory, produce greater trade disruptions than those we currently face. Additionally, a range of technical problems must be confronted before the AMS approach can be made operational.

Broadly, what are the possible roles for an AMS? Monitoring is at one end of a spectrum of possible roles for the AMS. A monitoring role means that an AMS is used to keep track of how countries are doing in meeting commitments that may have been made through any number of negotiating approaches, or merely to keep watch on the agricultural policy picture in relation to trends and events in world markets. Disciplines might be imposed on countries not meeting commitments, as indicated by the AMS, but these would be external to the AMS itself.

At the opposite end of the spectrum of possible roles is the AMS as a legally-bound instrument of negotiation. In this role, the AMS takes the part of a tariff schedule for agriculture. With no other accompanying restrictions on policy instruments, this role gives countries flexibility in choosing policy instruments. Accompanying rules, for example on policy switching, could be necessary to assure that AMS reductions coincide with reductions in trade distortions.

Intermediate roles include the AMS as a "triggering" or "crediting" device. Triggering suggests a more formal role for the AMS in the monitoring

process, whereby parties would be bound to take some prescribed action signalled by a predesignated change in the AMS. The AMS is used in this way in the U.S.-Canada Free Trade Agreement. The AMS could also be used to quantify "credits" or "debits" extended to countries for policy changes made since the negotiations began or since some negotiated base period.

AMS Measures

The first of the AMS measures proposed for GATT use is the Producer Subsidy Equivalent (PSE) as used in the Trade Mandate Study by the OECD. The PSE is defined as the payment needed to compensate farm producers for the loss of income resulting from removal of a given policy measure. The other two proposed measures are variations of the PSE concept. The Trade Distortion Equivalent (TDE), as proposed by Canada, is a PSE applied only to policy measures agreed to be significantly trade distorting, and it would take into account the effect of supply control measures. The Support Measurement Unit (SMU) as defined by the EC, like the TDE, focuses on policies that significantly affect farmers' production decisions and takes account of the effects of supply control measures. It further adjusts the PSE to remove the effects of exogenous world price and currency fluctuations.

The exact definition of an AMS should be determined by the use to which it is put. For example:

If the interest is:	Then an appropriate measure might be:
a measure of the level of total support	PSE
a measure of trade distorting support	TDE
a measure or trade distorting support and <u>changes</u> in that support due to policy change	SMU

If the use is:	Then an appropirate measure might be:
Monitoring	PSE, TDE, SMU, or Other (The more information to understand what is happening, the better.)
Triggering	TDE, SMU
Credit/Binding	SMU (No country will bind a commitment on a basis that it cannot control.)

The PSE or one of its variants has benefited from significant definition of calculation methodology, economic assumptions and agreement on concepts. The extent of further agreement required on such items for use of the PSE-type AMS is likely to be much less than for use of other measures, such as tariff equivalents or effective rates of protection, where agreement on such arcane concepts as elasticities and value-added coefficients may be

needed. Nonetheless a significant set of issues remain to be classified and negotiated before a specific AMS will be acceptable in an operational role.

How to make AMSs operational

If incorporated into GATT rules, then a well-functioning AMS would need to be defined that balanced the tradeoffs between simplicity and accuracy in reflecting the levels and changes in support. Simplicity is needed because with more complex and less clear measures, policymakers and observers would have more difficulty linking causes (policy changes) with effects (changes in AMS), thus making the measure less useful. On the other hand, there are many conceptual and technical problems associated with defining an AMS. The tradeoff between simplicity and accuracy likely will be difficult to achieve.

If an AMS is to play an important role in GATT rules, then the most important of these concepts and problems must be agreed upon by the negotiating parties. The most important issues include:

* An AMS can change for two reasons; (a) a change in "specified" policies or (b) a change in other policies or market conditions. Shall changes in (b) be included in the measure of AMS or held constant? What are "specified" policies?

* If the "other policies and market conditions" are to be held constant, a key issue is what reference price and base period should be used?

* This become a critical issue if the objective of the AMS is to measure trade distortion and the role is more than informal monitoring.

* Shall governments be allowed to increase any specific policy intervention -- i.e., would policy switching be allowed within a negotiated overall AMS level?

* How should production control be measured?

All the technical problems raised above can be solved to some degree of satisfaction. But these technical problems are serious. The information requirements are also substantial. Meeting the data needs in a timely way would be very difficult, even in the industrial countries. Still, we have some evidence that an AMS has a place in trade negotiations -- the United States and Canada included an AMS in their free trade agreement.

If GATT is to use the AMS concept in some way, institutional arrangements would need to be specified -- who would compute AMSs and when.

SUMMARY OF COLLECTED PAPERS

In the Mid-Term Review Agreement on Agriculture, reached in Geneva in April 1989, GATT Ministers agreed to pursue agricultural policy reform and to assign credit for "...measures implemented since the Punta del Este Declaration which contribute positively to the reform programme". Most of the papers included in this collection address the problem of using an aggregate measure of support (AMS) to ascertain the value of credit associated with particular policy changes. Most look at current methods used in calculating producer subsidy equivalents (PSE's) and discuss the shortcomings of these methods when considering the trade effects of particular policies. The policy set considered includes various supply control schemes, frozen U.S. program yields, the U.S. export enhancement program, and EC financial stabilizers.

The first paper looks at problems in using the AMS as a measure of trade-distortions (or as an indicator of reductions in trade distortions due to policy changes) when supply controls are present. With a simple graphical example, Don McClatchy makes the point that it is possible to have a high measured PSE and little or no production, consumption, or trade distortion. This is because supply controls can significantly reduce the level of production and trade distortion which would otherwise occur if the effects of the price or income support program were not constrained. McClatchy argues that, in principle, AMS reduction obligations should be proportional to the level of production distortion generated by the support package and he demonstrates that relatively straightforward, pragmatic approaches do exist to determine "approximately" the effect of supply controls on reducing the level of production distortion. Once this effect has been ascertained, credit for the distortion-reducing effects of supply controls could be granted in the form of downward adjustments in AMS reduction commitments. What McClatchy has done, essentially, is to suggest an adjustment factor that could be used in the conversion of PSE's to TDE's. It's a simple concept, but it does rely on negotiations over what countries' production would have been in the absence of the supply controls.

The second paper, by Tom Hertel and Marinos Tsigas, looks explicitly at alternative types of supply controls used in U.S. agriculture and asks

if they all have the same effect on trade. Hertel and Tsigas argue that alternative forms of supply control affect productive capacity and trade differently. They warn that supply controls may not provide the incentives necessary to move resources into alternative uses and, as a consequence, may only temporarily curtail supply. U.S. acreage controls, for example, have historically tended to increase productive capacity by promoting higher-yield agriculture; but U.S. output quota schemes (e.g., that now used in the tobacco program) tend to reduce productive capacity (provided the quotas are tradeable) because they encourage lower-input agriculture and a slower rate of growth in yields. Domestic marketing quotas (used, for example, in the U.S. peanut program) are the most trade-distorting form of supply control they consider. Such programs encourage surplus disposal because sales to export markets are not restricted. The main message is that negotiators must be very careful to fully understand the implications of any particular supply control program before granting credit for it. Another message is that, even if supply-control adjustment factors are derived, AMS's are still likely to tell incomplete stories about the effects of policy reform on the movement of agricultural resources into more productive uses.

Hertel and Tsigas go on, in the third paper to discuss a key aspect of the U.S. wheat program: the freezing of program yields. This U.S. policy change, implemented after 1985, began the process of "decoupling" deficiency payments from farm production decisions because farmers no longer have the incentive to increase yields in order to qualify for higher payments. In fact, Hertel and Tsigas argue that the freeze on yields reduces input use by program participants, thereby lowering output and export levels. They conclude that an AMS which counts all deficiency payments would be misleading as a trade distortion index, and that whatever AMS is used must be adjusted in order to credit the United States for having frozen program yields. They warn, however, that the permanency of this policy action is still uncertain and that if credit is to be given it should be accompanied by a bound commitment to the yield freeze.

In paper number four, Nicole Ballenger and Stephanie Mercier consider U.S. export enhancement program (EEP) in the context of an AMS. They use this example to demonstrate the interdependence among the numerous components of the U.S. Producer Subsidy Equivalent (PSE). For example,

when the EEP is changed it affects U.S. deficiency payments, storage payments, and CCC loan forfeitures through the effect on market prices. This makes it difficult to measure with precision the credit (or debit) associated with the EEP.

Ballenger and Mercier also point to problems applying a fixed reference price AMS to the EEP. Unlike administered price programs, the EEP lacks fixed program parameters, aside from occasional budget caps. The PSE calculation for the EEP relies on observations of the ex post subsidy. If reference prices are to be fixed, then some decision rule relating the EEP subsidy rate to the reference price must be devised in order to calculate the EEP component of the AMS.

In the fifth paper, Louis Mahe and Herve Guyomard take on the supply control problem from a somewhat different perspective than McClatchy. Like McClatchy, they argue that when policy instruments are both quantities and prices, rather than prices only, the familiar PSE is not very useful for measuring credits. They show that when production quotas are in place, the total income transfer, or PSE, can be decomposed into a "decoupled transfer" and a "supply-distorting transfer". As its name suggest, the supply-distorting transfer is the part which is responsible for supply increases above free trade levels. It is this part, they argue, that must be measured in order to credit countries for reform of these types of programs. Unlike McClatchy, these authors would rely on calculations of shadow prices associated with the quota rights rather than on estimates of what production would have been in the absence of the quota. If a market for quota rights exists, these shadow prices might be observed; otherwise, they must be estimated with economic models. The authors estimate credits for EC policy measures taken between 1986 and 1988.

Fabrizio De Filippis and Luca Salvatici continue the above theme in paper six. They discuss key EC policy changes, including supply control measures such as quotas for dairy and sugar, and optional set-aside, extensification and pre-retirement, and budget measures such as co-responsibility levies and financial stabilizers. The effects of these measures show up differently in the PSE as currently calculated, and the authors argue that the PSE is more sensitive to the effects of the financial stabilizers than to those of quotas.

De Filippis and Salvatici show that the effects of production quotas are not captured in the EC's percent PSE. However, if only the numerator of the PSE (that is, the total PSE) is used, the quota effects do register. Noting that total PSE's are not good bases for comparisons across countries, the authors return to the notion that percent PSE's might be adjusted to account for distortion-reducing effects of supply controls with methods like those suggested by our other authors.

PSE's are much better, these authors show, at crediting the EC for its financial stabilizers--programs that reduce the price paid to farmers and impose co-responsibility levies when predesignated production quantities are overshot--than for its production controls. They also conclude, using estimates of changes in the total PSE for cereals, that the EC set-aside program does little, at least currently, to control EC oversupply.

The last paper by Martin Johnson, Terry Roe and Louis Mahe, departs totally from examination of the AMS as a measurement device. It specifies particular sets of policy changes in two negotiating countries, in this case the U.S. and the EC, in a game theory context. Political weights are assigned to reflect the relative levels of influence in the negotiation by producers, consumers and taxpayers and gains and losses for each of these groups are calculated for each combination of policy changes. The result is a net gain or loss to each country from undertaking policy changes in light of policy changes made by the other country. The paper demonstrates a bilateral "request and offer" approach to the negotiation. These authors find that in the absence of compensatory payments, mutually advantageous agreement between these two parties seems to exist only for marginal changes in agricultural policies. The possibility of obtaining GATT agreement on more substantial reform is greatly increased, they contend, if budget savings are used to compensate the politically powerful losers. Their results suggest that AMS's, at a very minimum, constitute a crucial information base.

APPLYING THE AMS TO SUPPORT PROGRAMS INCORPORATING SUPPLY CONTROLS

Don McClatchy

A given level of income support (PSE) can be associated with trade effects ranging all the way from negligible to substantial, depending on the type of policy instrument used. The extreme of high income support associated with negligible trade effects is illustrated by the example (see Annex A) of a program providing deficiency payment support for production effectively controlled at the level which would be forthcoming if producers were to face world equivalent prices for their product (and assuming consumption occurs at world equivalent prices). In practice, there exist instances of support for managed levels of supply which approach to varying degrees this theoretical extreme. Obligations to reduce such support should reflect the degree to which trade is in fact, distorted. Adjustments to formula-based AMS reduction commitments would be appropriate in such cases.[1]

The case of production or marketing control programs, at least, provides an example where the needed adjustment is straightforward and simple. The effect of such measures on production is often both substantial and estimable to a reasonable degree of accuracy. In situations where effective marketing or production control exists, it is proposed that special rules and procedures for AMS calculation be adopted.

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1. Ideally, an AMD (Aggregate Measure of Distortion) rather than an AMS might be used in the GATT negotiations. Such a measure would conceivably formally account for key factors determining the trade volume distortion generated by any given farm support program, such as demand side price distortion (as sell as supply side price distortion) and values of the relevant supply and demand elasticities. However, member countries are generally in agreement that such sophistication would not be practicable in the GATT context. While AMS details remain to be worked out, the idea that it be a modified/simplified PSE seems to be generally accepted. In other words, a measure of production support is proposed to be used as a proxy for the level of trade distortion. Having accepted this, it would seem sensible to make adjustments to AMS reduction commitments in cases where the measured level of production support bears little logical relationship to the level of trade distortion generated by that support.

At their option, countries could present their estimates of:

A. Their base period production level if their farmers had faced world equivalent prices, and

B. Their base period production level if their farmers had enjoyed existing support levels without supply constraints.

These estimates would be subject to cross-examination by, and negotiation with, other countries.

Once agreement had been reached, they would then be used in conjunction with:

C. Observed (actual) base period production level under supply controls.

The base period AMS would be multiplied by the factor (C-A)/(B-A). The depth of cut would then be applied to the product of this multiplication, to calculate the appropriate AMS reduction commitment. This reduction would then be subtracted from the base period AMS to determine the target level of AMS for the end of the transition period. At the same time, rules should be developed to ensure that AMS reduction commitments could only be satisfied in ways that would result in reduced adverse trade effects. This proposal is elaborated in Annex B.

It may at first sight appear that countries could be expected to argue that C was equal to A, since this would have the effect of eliminating their AMS reduction commitments (i.e., put them in the zero-distortion situation illustrated in Annex A). However, to so argue would also be to implicitly admit that none of the price support provided to their producers was necessary in order to generate domestic supplies at current levels. Similarly, to argue that domestic producers need all the price support they get in order to generate current production levels would be to concede that B was equal to A, that the supply controls were non-constraining and, therefore, that no downward adjustment in AMS reduction commitments would be appropriate (i.e., to admit to being equally as distorting as the country providing open ended support at the same per unit level). In light of such considerations, it seems likely to be quite reasonable, reflecting a balance being struck between the above arguments. For example, if A were put at zero, which seems quite possible, it is unlikely that B would be reduction commitment unreasonably low.

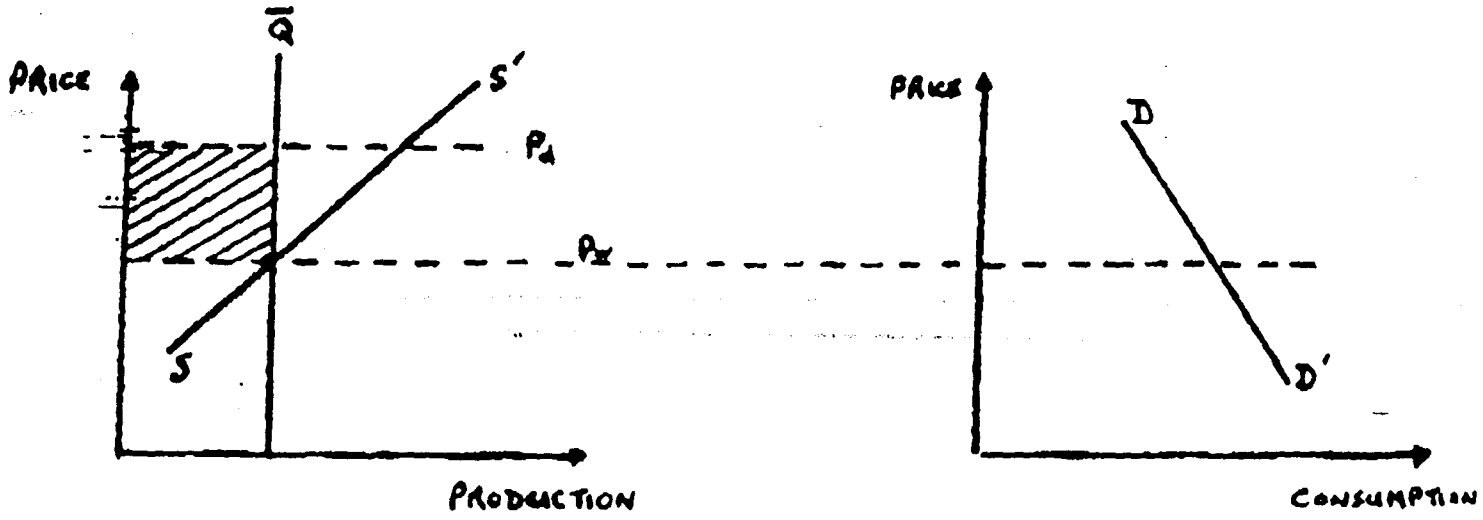
The argument that a supply management program may be inefficient or ineffective in one way or another is irrelevant. Most agricultural support measures can be criticized along the same lines. As long as the objective of the GATT negotiations is reducing adverse trade effects of measures, then measures with small trade effects should remain relatively unaffected by GATT disciplines and commitments, irrespective of how poorly they may stand up to scrutiny under other criteria.

Looked at another way, there is no point in forcing AMS reductions if no benefits to trade would be derived. This suggests the need, at least, for rules to ensure that AMS reduction commitments be achieved in ways which would benefit other countries. By the same token, the commitment to reduce should be based only on the scope which exists for AMS reductions which would be beneficial to trading partners, where this is less than the total scope for AMS reduction. For example, suppose farm level production or marketing quotas were associated with a direct (e.g. deficiency) payment support program. In such a case, assuming the quotas were binding, no reduction in production and trade volume distortions could be expected to result from (marginal) reductions in the level of per unit direct payments (if the supply control was voluntary, - say by way of meeting set-aside requirements as a condition for receiving deficiency payments, - program participation may even fall, and production distortion level increase, as a result of reductions in target prices). Thus, in such a situation, it is suggested that reducing the aggregate level of production or marketing quotas (or increasing the percent set-aside requirements in the case of the voluntary program) would be an acceptable method of achieving AMS reduction commitments. Per unit direct payment reductions, on the other hand, would not.

Another conceivable example would be where mandatory supply control was associated with farm level support provided via a combination of domestic market price support and direct government payments. Then, AMS reductions would be trade distortion-reducing if achieved by means of reductions in the level of aggregate supply quota or via reductions in the supported level of domestic prices, but not if achieved through reduction in the level of direct payments.

Thus, it is proposed that if a country was to apply for and be granted some "credit" (in the form of reduced AMS reduction obligations) for the fact that it implemented some form of supply control as part of its overall support package, such credit would be conditional on it achieving its AMS reduction through means which would further reduce any remaining production and trade distortions.

ANNEX A: THE EXTREME CASE OF A HIGH TOTAL PSE ASSOCIATED WITH NO TRADE EFFECTS

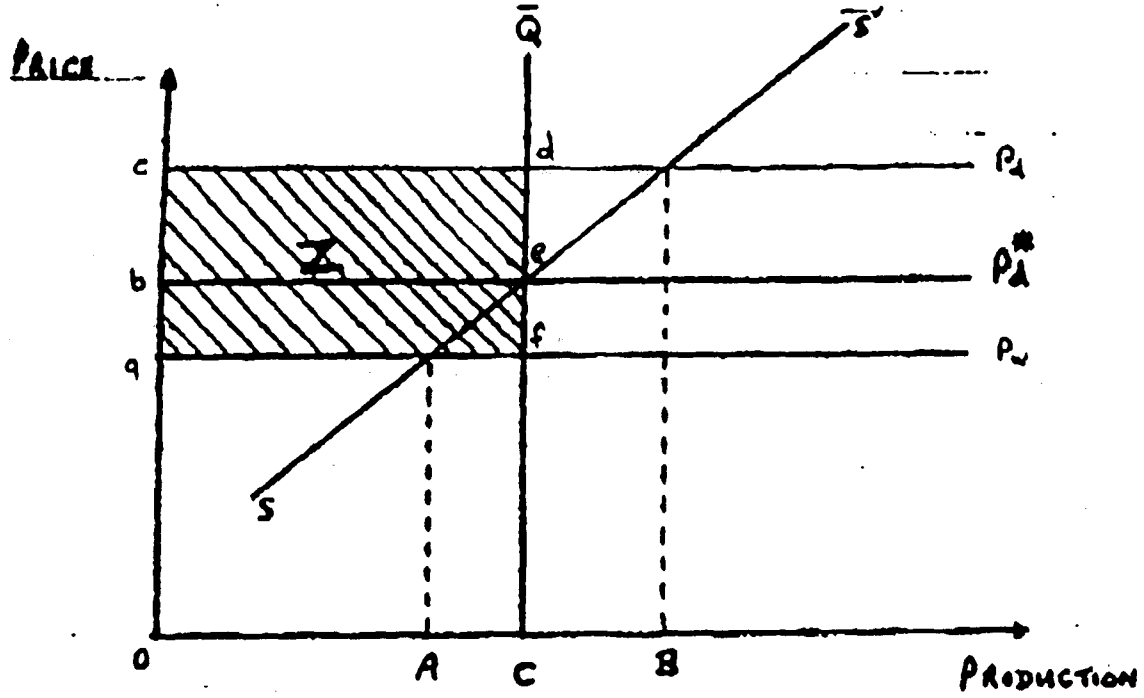


Pd = Price to farmers (supported via deficiency payments)
Pw = World market equivalent price
$\bar{Q}$ = Controlled supply in base period

Base period PSE = shaded area
Base period CSE = 0

Base period production distortion = 0
Base period consumption distortion = 0
Base period trade distortion = 0

ANNEX B; ILLUSTRATION OF PROPOSED APPROACH TO CALCULATION OF AMS REDUCTION OBLIGATION IN CASES INVOLVING PRODUCTION CONTROLS OR MARKETING CONTROLS



Pd = price to farmers

Pd* = price to farmers which would be necessary to induce base period production volume in the absence of controls.

Pw = world market equivalent price

OC = $\bar{Q}$ = controlled/managed production in base period

OA = expected production if farmers faced world prices

OB = expected production if farmers faced supported price in absence of supply controls

Base period AMS = shaded area = Z (=acdf)

Base period trade distorting AMS equivalent = Z((C-A)/(B-A))

(= abef when supply curve linear)

Let agreed depth of cut = X %, and x = X/100

Then AMS reduction commitment = xZ(C-A)/(B-A)

Maximum (target) AMS at end of transition period = Z -xZ (C-A)/(B-A)

Commentary

The above diagram can be taken to illustrate the situation in two different countries with the same underlying supply response function:

Country A pays its farmers price Pd, but also applies controls to limit production to OC.

Country B pays its farmers a lower price, Pd*, but does not restrict output; production is also OC.

Both countries distort production by the same amount (C-A), which would suggest that both should be required to reduce their distortion by the same amount under a "balanced reduction of trade effects" agreement. However, the two countries' total AMS levels are quite different, - that of Country A being the area acdf (shaded area Z) and that of Country B the area abef. Thus an equal percentage AMS reduction would require a considerably greater producer price reduction in Country A than in Country B. Worse, the higher price reduction in Country A, would, if less than (Pd - Pd*), have no effect on production in that country and, thus, may possibly be of no benefit to other countries and world trade. Any price decrease in Country B, on the other hand, would result in a commensurate reduction in production, and therefore also in trade distortion, in that country.

The sensible solution to this paradox would appear to be to require both countries to reduce their production to the same degree. This could be achieved by requiring equal absolute reductions in their (different) total AMS levels (equal, in both cases, to X percent of the area abef above) coupled with rules to ensure that, in the case of Country A with production controls, the required AMS reductions could only be achieved by means which would reduce trade distortions (i.e., in this simple example, reductions in production quota rather than reductions in producer prices; in the broader context, decreased domestic market support prices, decreased exports, increase in import quotas, etc., would also contribute to reduced trade distortions).

SUPPLY CONTROLS IN U.S. AGRICULTURE

Thomas W. Hertel and Marinos E. Tsigas

Many different forms of supply control are employed in U.S. agriculture. These include: acreage controls, output quotas, domestic marketing quotas, and various types of marketing orders. From the point of view of the international trade negotiations, we are primarily interested in the effect which such measures have on: (a) exports, and (b) productive capacity. Export levels are of interest, since they potentially influence world prices. The impact of supply control measures on productive capacity is also important. If output is restricted, but the capacity to produce at higher levels remains in place, then these measures will only be temporary in their effect. By contrast, controls which simultaneously restrict supply and encourage resource adjustment out of agriculture are likely to have a more permanent effect on output, exports, and world prices.

Rather than go through an exhaustive list of programs and commodities, we have chosen to focus on the major program crops--and examine the implications of alternative mechanisms for restricting their supply. Consider first a voluntary acreage reduction program (nicknamed a "bid ARP"). Here, we assume that the government bids sufficient food grain, feed grain, oilseed, and cotton acreage out of production in order to raise market prices by 10 percent. (This is not unlike the current Conservation Reserve Program except that it is not explicitly targeted to environmentally sensitive acreage.) The first group of columns in Table 1 report the medium run (4 year) percentage changes in output and exports for each of the major program crop categories. Exports always fall by a greater proportion than output, due to the fact that export demand is more price responsive than domestic demand. In this "bid ARP" experiment, planted acreage falls by 11 percent and medium run yields are higher for all of these crops, as a result of increasing per acre applications of nonland inputs. If one measures capacity as the productive potential of resources current employed plus that which is idled, then one might argue that, by promoting higher yield agriculture, acreage controls actually increase productive capacity. Of course, this conclusion would be altered if idled acreage were encouraged to move into alternative uses. However, in most rural areas there are few alternative uses which can compete successfully (on a broad scale) with commercial agriculture.

The second group of columns in Table 1 report results from an experiment whereby tradeable output quotas are issued, on the basis of historical production. Once again these measures are designed to raise market prices by 10 percent over 1984 levels. Thus the requisite output and export reductions are quite close to those in the first column. However, the impact on the use of variable inputs and yields is dramatically different. Now nonland input use falls rather than rises. In effect, program crop production evolves towards a lower input type of agriculture. [This differential effect of acreage and output controls on yields has been observed historically in the case of the tobacco program. In 1986, tobacco allotments switched from a per-acre to a per-pound basis. Foster and Babcock show that this had the immediate effect of lowering yields, after which point they proceeded to grow at a much slower annual rate (0.8 percent/year vs. 3.8 percent/year).]

Provided output quotas are tradeable, they result in resources leaving agriculture and thus serve to reduce production capacity. Of course if quotas are not freely traded, for example if they are tied to individual farms or producers, then they may actually exacerbate the problem of excess capacity. This is because small producers may be encouraged to remain in production at an inefficient scale of operation. Empirical evidence indicates that the Canadian dairy program has had this type of effect (Moschini).

The last experiment in Table 1 illustrates the case of domestic marketing quotas. This is analogous to the U.S. peanut program, whereby domestic sales are restricted, but surplus output may be disposed of onto the world market. As can be seen from the last columns of Table 1, this is a far less effective means of restricting output. Furthermore, exports actually increase under this "supply control" regime. The validity of these results is underlined by recent experience with the peanut program. After switching from output to domestic marketing quotas under the 1981 Farm Bill, peanut exports actually increased between 1982 and 1986. This bucked the trend for other farm products for which exports were falling dramatically over this same period.

In sum, the method chosen for implementation of supply control can make a big difference. Tradeable output quotas tend to reduce both exports and productive capacity in agriculture. Acreage controls are effective in reducing exports, but do less to encourage a decline in capacity. Domestic marketing quotas actually have the potential for increasing exports! (This is hardly the type of supply control measure for which countries should receive "credit" in the GATT negotiations.) In the event that such credits are to be assigned, individual measures must be carefully evaluated to assess their impact on exports and the long run productive capacity of the farm sector. It should also be borne in mind that the best policy for reducing global surpluses will usually be to attack the problem directly. This may involve measures such as reducing subsidy levels or facilitating the adjustment of resources out of the farm sector.

Table 1. Percentage Changes in Output and Exports for Major Program Crops Under Alternative Supply Control Measures, Each Designed to Raise Domestic Prices by 10% Over 1984 Levels.[a,b]

Crop Category	Acreage Controls		Output Quotas		Domestic Quotas	
	Output	Exports	Output	Exports	Output	Exports
Foodgrains	-2.4%	- 4.8%	-2.4%	- 4.9%	-0.5%	-0.3%
Oilseeds	-4.5	-11.7	-4.6	-11.8	-0.2	+2.2
Feedgrains	-5.7	-12.0	-5.9	-12.1	-3.0	+4.5
Cotton	-9.9	-29.0	-9.9	-29.2	-0.7	+0.4

Source: Hertel and Tsigas.

[a] All results refer to a medium-run (4 year) time horizon.

b The effect of these measures is simulated in the presence of those programs already in place in 1984. (The reason for picking this historical period is that complete data for the current year are not yet available. Furthermore, current program expenditure levels are more nearly akin to pre-1985 Farm bill levels.) However, in order to retain the market-oriented spirit of the 1985 Farm Bill, we assume in this analysis that loan rates are not supporting world market prices. All results refer to a medium-run (4 year) time horizon.

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THE U.S. WHEAT PROGRAM

Thomas W. Hertel and Marinos E. Tsigas

The U.S. grains programs provide a complicated puzzle for economists and negotiators interested in trade liberalization. On the one hand, set aside requirements reduce planted acreage, output and exports. However, the "bribe" for voluntary idling of land consists of deficiency payments, which may provide an incentive for increasing yields on that acreage which is ultimately planted, perhaps inducing some land to stay in grain production instead of moving into alternative uses. The relative strength of these competing effects varies from year to year. However, the freezing of program yields under the 1985 Farm Bill has undoubtedly reduced the incentive effect associated with high target prices. The purpose of this case study is to investigate the potential implications of this action.

It is difficult to know how long it took farmers to grasp the implications of the freeze on established yields. This feature was included late in the debate over the 1985 Farm Bill, which wasn't passed until December of 1985--already part way through the 1986 crop year for wheat. Since program yields have always been updated in the past, many farmers continued to report these yields at the local ASCS offices. As a result of this uncertainty, it is difficult to know to what degree the change in policy has actually been reflected in producer decisions. In any case, the reaction of farmers was undoubtedly a delayed one. Calls for the repeal of this provision have only recently been heard on Capitol Hill.

In order to assess the implications of freezing program yields for wheat, we have conducted several simulation experiments with a mathematical model which accounts explicitly for the heterogeneity of the U.S. wheat acreage base. This work is still in progress, however preliminary results are reported in table 1. They refer to the predicted first year effect of permanently freezing yields, prior to a given crop year. They assume all farmers recognize that current yields will not be reported and will in no way affect future payments. Also, total wheat acreage is assumed unchanged by the freeze.

In order to examine the sensitivity of this type of a freeze to different program conditions, we simulate this policy in two different crop

years: 1982 and 1986. The first represents a period of relatively strong market prices and modest participation rates, while 1986 was a year of much higher benefits and hence higher participation rates.

The first effect of the freeze on yields is to reduce optimal variable input levels of program participants, since they no longer consider the target price in making such decisions. This drop is particularly dramatic (-22.7 percent) in 1986 when the target price was far in excess of market prices for wheat. As a consequence, realized yields fall. These may even fall below established yield levels. Thus if it was desirable to be in the program before, it will still be attractive afterwards, provided there is no change in the market price of wheat.

Of course, one consequence of reduced yields is lower output and hence lower export levels. We estimate that 1986 output would have been 11.2 percent lower in the presence of a preannounced, permanent freeze on program yields (table 1, column 1). Lower wheat output raises market prices and induces some farms to leave the program. We project that participating acres fall by 5.9 percent or about 3.9 million acres. A secondary effect of this lower program participation rate is to slightly increase planted acreage (by 1.1 million acres). This moderates the decline in total and variable inputs which fall by 21.4 percent.

Perhaps the most interesting consequence of the freeze on program yields is the subsequent rise in land rents. With inelastic shortrun farm level demand, the market price of wheat rises more than output falls. Thus receipts from the marketplace rise. Deficiency payments are paid as the product of the frozen program yields and program acreage (which declines only slightly). They fall primarly due to the rise in market prices. However, total farm receipts rise, while variable input expenditures fall. Thus returns to the residual claimant on income--land--must rise. The magnitude of this effect is negatively correlated with the change in land-substituting nonland inputs. Thus it is strongest in 1986, when land rents rise by almost 16 percent.

The next column of table 1 reports the effects of a permanent freeze on program yields prior to the 1982 crop year. In 1982, the gap between the target and market prices was relatively modest, as was the level of

participation in the wheat program. As a result, the impact of the yield freeze or the rate of nonland input use is also small, although there is still a significant effect on program participation.

The results in table 1 reflect the shortrun (one year) responses to a freeze on program yields. In the longer run several additional dimensions come into play. First of all, as technological process raises yields, we can expect the frozen program yields to fall farther and farther behind. This will tend to discourage participation. Working in the opposite direction is the fact that the long run export demand elasticity is considerably larger than its one year counterpart. This will moderate the long run market price increase following the reduction in U.S. wheat output. Since this was the factor leading to a short run decline in participation, it too will be moderated. Finally, there is the question of wheat acreage response. Over time, higher land rents will tend to draw additional acreage into wheat production, provided returns to alternative cropping activities are unchanged. This will tend to moderate the long run decline in wheat output.

Table 1. ShortRun Implications of a Permanent Freeze* in Program Yields for U.S. Wheat (Percentage Change in Selected Variables)

Variable	Year of Freeze 1986	1982
Variable Inputs		
-per planted acre	-22.7%	-1.5
-total applications	-21.4	-1.2
Output	-11.2	-0.4
Exports	-16.9	-0.6
Participating Acres	- 5.9	-4.8
Average Annual Return to land	+15.9	+0.9

*These are preliminary results. Final estimates will be available from the authors in January, 1990.

INCORPORATING THE EXPORT ENHANCEMENT PROGRAM IN THE PSE

Nicole Ballenger and Stephanie Mercier

This paper looks at the incorporation of the U.S. export enhancement program (EEP) in the U.S. producer subsidy equivalent (PSE). It shows how the EEP component of the PSE relates to other PSE components, thereby making it difficult to directly assess the EEP's contribution to total producer support. This lack of policy independence complicates the issue of how to credit (or debit) the United States for changes in EEP policy. The paper also looks at the EEP in the context of a fixed reference price PSE. Since the EEP does not have fixed parameters, such as a known subsidy rate, and would be expected to vary with the reference price, some rule must be assumed for calculating the EEP component of a fixed reference price PSE.

The Export Enhancement Program

The EEP was introduced in the spring of 1985 for the purpose of expanding U.S. exports, particularly by countering export subsidies of competing suppliers. Under the program, bonuses in the form of generic certificates exchangeable for commodities held in CCC inventory are awarded to exporters who win USDA approval to make sales in targeted markets at discounted prices. The EEP has been used most widely for wheat (where competition from the EC has been fierce), but has also covered barley, poultry and eggs, rice, vegetable oil, and several other commodities.

Bonuses--the official name for EEP subsidies--have varied considerably since the EEP began. For example, in the case of wheat, bonuses per ton sold under the program averaged $27 in 1985/86 (or 21 percent of the U.S. FOB Gulf export price), $37 in 1986/87 (34 percent of the export price), $34 in 1987/88 (28 percent of the export price), and $19 (or 12 percent of the export price) through March of the 1988/89 marketing year (USDA). The average monthly EEP bonus has ranged from a high of $45 per ton in October 1985 to a low of $14 per ton in November 1988 (USDA). Bonuses vary by country and have generally been higher for the more contested markets and lower for those where the EC has been less competitive (USDA).

Recent criticism of the EEP has prompted the Administration to narrow the objectives of the program, focusing on its ability to pressure the EC

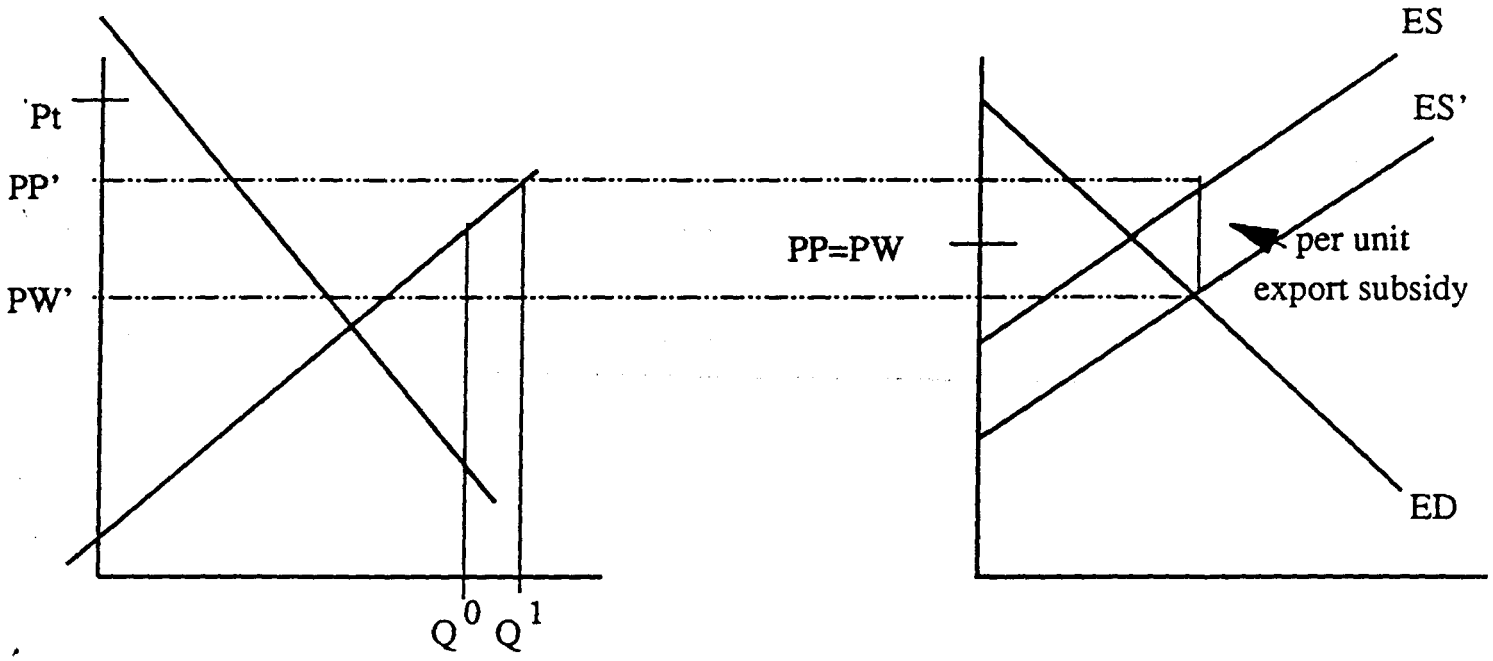
toward policy reform by raising the Community's budget for export restitutions and challenging its market presence. Consequently, EEP decision makers will be responsive to changing market conditions, particularly as influenced by the EC, in choosing country and commodity targets, as well as EEP prices and bonus levels. This makes the EEP very different than an export subsidy fixed in either ad valorem or dollar units, and poses a challenge to analyzing the EEP component of an aggregate measure of support. The EEP is also different than policies designed to maintain prices or income at some specific level.

Measuring the producer subsidy equivalent of the EEP

The EEP is incorporated in the U.S. PSE's in a simple, straightforward fashion, abstracting from the effect of stocks released as bonuses. After each crop year the ex post export subsidy rate is calculated by dividing total EEP bonuses for the particular commodity by the total exports of that commodity. This per unit subsidy rate (for example, $26 per ton for wheat in 1987) is then multiplied by total production in order to derive the total value of transfers to producers associated with the EEP. This approach takes a backward look at the EEP, making it appear no different than the provision of support through a uniform subsidy on every unit exported. Figure 1 gives a graphical representation of the EEP component of the PSE.

Figure 1 helps make two important points. First, the EEP affects other programs measured in the PSE through its effect on the market price. As the figure indicates, if the EEP were eliminated, domestic market prices would be likely to fall. This would increase the taxpayer contribution to the PSE in the form of higher deficiency payments (assuming unchanged target prices and that deficiency payments were based on the market price rather than the loan rate). Storage payments and loan forfeitures would also be affected--and would probably increase with the EEP's elimination--because these components are also affected by market prices. Thus, the EEP does not operate independently from other U.S. programs and changing the EEP will change these other PSE components. This makes it difficult to say precisely what the value of the U.S. PSE's would be without the EEP, but
suggests that the total PSE would be reduced by less than the EEP component.

Figure 1. Simplification of U.S. PSE with deficiency payments and EEP



Pt= target price (fixed)
PP= producer market price
PW=world price

(Pt-PP)Q=deficiency payments (DP)
(PP-PW)Q=EEP

initial DP component

$$\text{PSE(before EEP)} = \frac{(Pt-PW)Q^0}{PtQ^0} = \frac{Pt-PW}{Pt}$$

new DP component EEP component

$$\text{PSE'(after EEP)} = \frac{(Pt-PP')Q^1}{PtQ^1} + \frac{(PP'-PW')Q^1}{PtQ^1}$$

$$= \frac{(Pt-PW')Q^1}{PtQ^1} = \frac{Pt-PW'}{Pt}$$

PSE'>PSE, but DP component smaller

Second, the figure shows the relationship between the EEP subsidy, the producer price, and the reference price. In the calculation procedure, the ex post EEP subsidy rate and the observed producer price (which is a function of the EEP and other variables) are used to derive the the reference price (which is not actually observed). Suppose the reference price was predetermined (in order to remove the effects of unstable reference prices on PSE's). In this case, because the EEP has no fixed parameters, either the subsidy rate or the producer price would have to be assumed in order to derive the new EEP component. If the producer price is assumed unchanged--such that the EEP component relies on the difference between the observed producer price and the fixed reference price--the underlying assumption is that the EEP subsidy is set so as to maintain producer prices unchanged (like the variable levy/export subsidy system used by the EC). If the $/ton EEP subsidy rate is assumed unchanged--such that the new producer price is determined by the reference price plus the subsidy--the underlying assumption is that the EEP program is unresponsive to price changes in the overseas markets and maintains a constant margin between U.S. producer and export prices. Some rule would have to be devised in order to translate reference price changes into changes in EEP subsidy levels.

Changes in PSE's due to the Export Enhancement Program

The EEP was first incorporated in the U.S. PSE's with the 1985 or 1986 calculations, depending on when the commodity was first sold under the auspices of the program. Currently, barley, poultry, rice, and wheat PSE's contain EEP components. Without taking into account policy interactions, the EEP component's contribution to the PSE varies markedly by commodity and year. Although wheat accounts for by far the largest share of EEP shipments, as a contributor to the PSE the EEP was more important to some other commodities. For barley, the EEP component represented about 50 percent of the total transfers to producers in 1986 and 1987; for poultry the EEP accounted for somewhat under 50 percent of the transfers in 1986 and more than 50 percent in 1987; for rice, support through the EEP has been negligible; for wheat, the EEP contributed 7 percent of transfers in 1985, 10 percent in 1986, and 25 percent in 1987 (Nelson).

The EEP component of the PSE's generally grew from 1985 to 1986 and again between 1986 and 1987 as more government funds were allocated to the program and the total value of commodity bonuses grew accordingly. For example, EEP bonuses for wheat rose from $271.6 million in 1985 to $1453.4 million in 1987, a 435 percent increase over that period. However, it should be noted that for the program commodities (barley, rice, and wheat), producer income is little, if at all, affected by the EEP even if the EEP is a significant component of the PSE. For these commodities, producer income is maintained with the target price, particularly when farm program participation is as high as it was during these years. Nonetheless, the direct effect of the EEP on the PSE is to raise transfers by driving a wedge between domestic market prices and export (or reference) prices. The indirect effect, as illustrated above, is to shift some of the source of producer support from taxpayers to consumers as domestic prices are raised above export prices.

Changes in the PSE's have a variety of underlying causes. Between 1985 and 1986, the U.S. wheat PSE increased from 38.6 to 61.2 (figure 2). Much of this period's increase was due to a 13.7 percent decline in wheat production. In fact, changing output alone between 1985-86 would have caused the PSE to jump to 50.3, accounting for 52 percent of the shift. Changing other types of government payments (excluding EEP) accounted for 34 percent of the change, leaving only 14 percent to be accounted for by the increase in EEP spending levels (figure 3).[2]

Between 1986 and 1987, the U.S. wheat PSE rose from 61.2 to 63.3 percent (figure 2). Decomposition of this shift reveals a very different picture from 1985-86. Over this second period, wheat output increased just under 1 percent, which alone would have decreased the PSE to 58.4 percent. Similarly, other transfers to wheat producers (except EEP) decreased, which would have decreased the PSE further, to 53.5 percent. The large increase in EEP transfers offset the declines that would have occurred in the PSE due to the other factors, and increased the PSE slightly instead. As suggested above, the increase in EEP probably contributed to a decrease in

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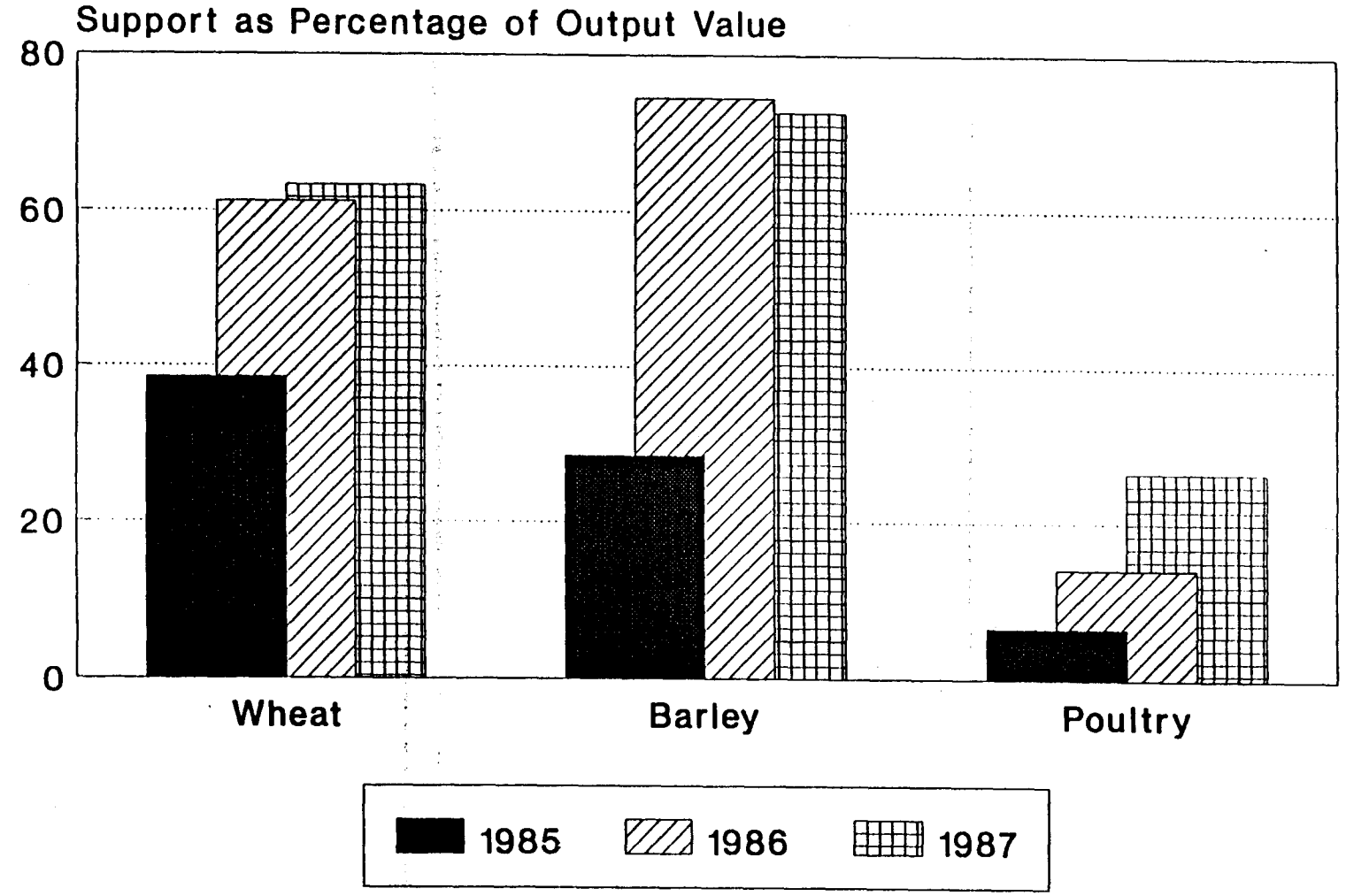
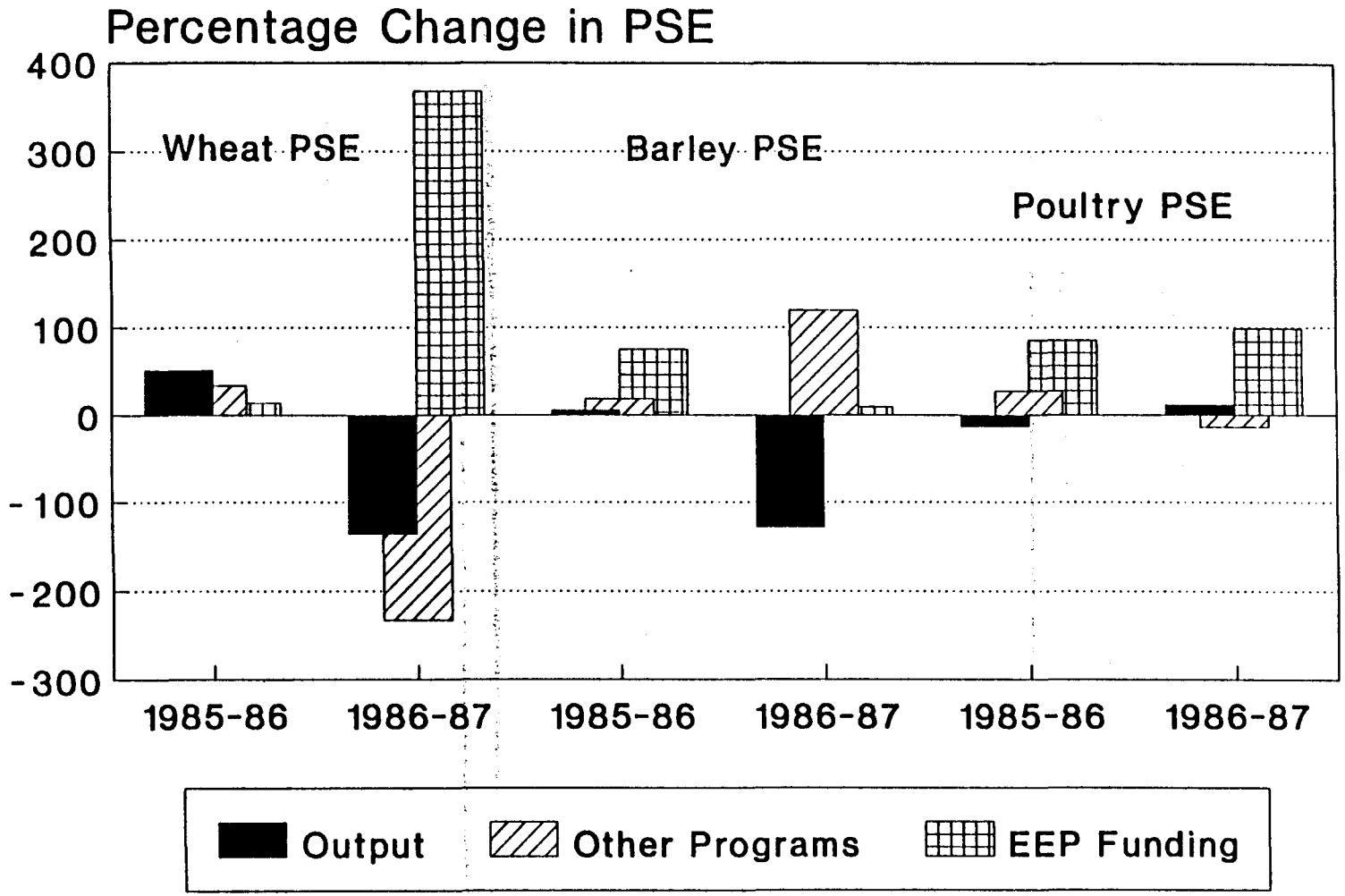
2. This analysis of the sources of change in the PSEs is purely static in that it does not take into account how changes in the EEP might have caused changes in the other PSE components.

Figure 2. Changes in Selected U.S. PSE's, 1985-87



Source: Nelson

Figure 3. Decomposition of Changes in Selected U.S. PSE's, Year by Year



transfers through some other sources, such as deficiency payments, loan forfeitures, and storage payments.

The EEP and Measures of Producer Support Using Fixed Reference Prices

The PSE used in the above discussion allows the reference price to differ from year to year. Some participants in the Uruguay Round maintain that use of a world reference price that varies annually in the support measure could reflect changes in exchange rates and other prices that are not the result of agricultural policy decisions. The EC, for example, has proposed an aggregate measure of support with a fixed reference price called the subsidy measurement unit (SMU).

Table 1 shows the changes in the market value of output (value of output = output times producer price = output times reference price plus total EEP bonuses) and the PSE resulting from assigning a fixed reference price and using three alternative rules for determining the PSE component. Two fixed price scenarios are considered: 1) a high fixed reference price (HFRP), in which the world reference price from 1985 ($107.61/ton) is used for both 1986 and 1987 PSE's, and 2) a low fixed reference price (LFRP), in which the world reference price from 1987 ($70.49/ton) is used for 1985 and 1986 PSE's.

Using the low reference price, and assuming that total EEP bonuses (or the subsidy per ton of exports) and all other government spending remain unchanged (Rule 1), the PSE increases over the original estimate. This result follows from the fact that the numerator of the PSE (the value of policy transfers) remains, by assumption, unchanged while the value of the denominator (market earnings plus direct payments) falls along with the reference price. The high reference price generates the opposite effect.

However, given the nature of the EEP, fixing a reference price and leaving EEP bonuses unchanged generates a PSE figure that is not particularly meaningful. As discussed above, EEP bonuses vary by transaction, instead of being fixed by law. EEP expenditures would be likely to vary with world prices movements because the program is designed to keep U.S. exports competitive in world agricultural markets. Figure 4

Table 1.– Wheat PSE's using Different World Reference Prices

Year	Reference Price	Value of Output	PSE	Reference price/ EEP decision rule
	$/ton	$mill.	percent	
1985	107.61	7374.2	38.6	original PSE
1985	70.49	4924.7	51.1	LFRP/Rule No.1[a]
1985	70.49	5018.4	51.7	LFRP/Rule No.2, 34%[b]
1985	70.49	7374.2	65.7	LFRP/Rule No.3, $123[c]
1986	78.63	5044.3	61.2	original PSE
1986	107.61	6693.8	52.1	HFRP/Rule No. 1[a]
1986	107.61	6483.6	51.1	HFRP/Rule No. 2, 37%[b]
1986	107.61	5044.3	49.7	HFRP/Rule No. 3, $88[c]
1986	70.49	4581.1	64.3	LFRP/Rule No. 1[a]
1986	70.49	4639.8	64.6	LFRP/Rule No. 2, 10%[b]
1986	70.49	5044.3	72.1	LFRP/Rule No. 3, $88[c]
1987	70.49	5496.8	63.3	original PSE
1987	107.61	7625.5	51.2	HFRP/Rule No. 1[a]
1987	107.61	6855.2	46.8	HFRP/Rule No. 2, 53%[b]
1987	107.61	5496.8	39.7	HFRP/Rule No. 3, $95[c]

Note: HFRP, LFRP = high, low fixed reference prices. The high price is from 1985, and the low price is from 1987. Deficiency payments and spending on other government programs are assumed unchanged.

[a] Rule No. 1 assumes no change in EEP funding (or bonuses) when reference price is changed.

[b] Rule No. 2 assumes EEP funding is changed the same percentage that the reference price changes, but in the opposite direction. Percentage shown is proportion by which EEP funding changes.

[c] Rule No. 3 assumes that EEP bonuses are set so as to maintain the producer price actually observed in the year under consideration. Dollar amount shown is the producer price for that year.

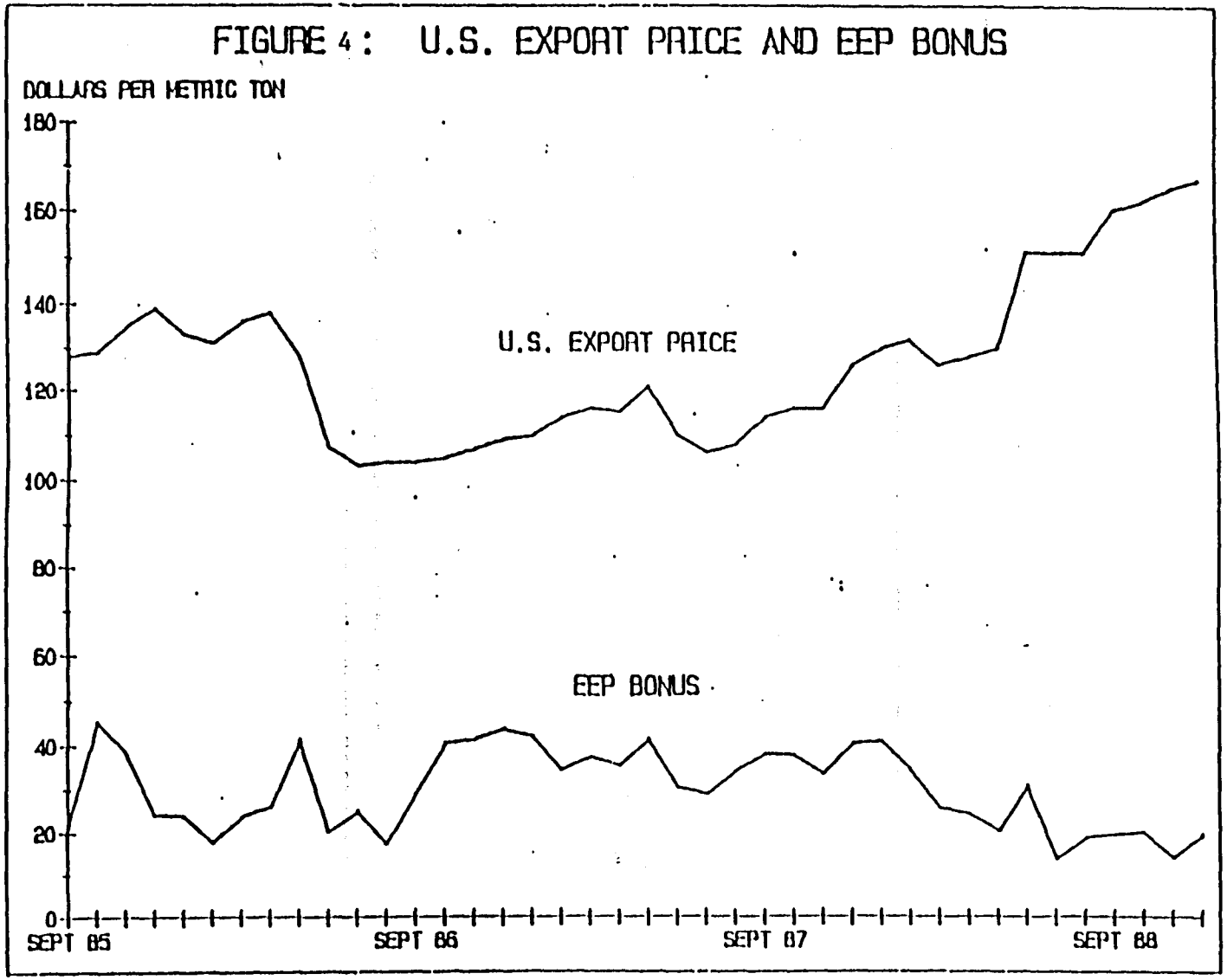


FIGURE 4: U.S. EXPORT PRICE AND EEP BONUS
DOLLARS PER METRIC TON
180
160
140
120
100
80
60
40
20
0
U.S. EXPORT PRICE
EEP BONUS
SEPT 85
SEPT 86
SEPT 87
SEPT 88

Source: USDA

opposite direction of U.S. export prices--as export prices have risen, bonuses have fallen. Thus, a second rule for incorporating the EEP in a fixed reference price PSE would allow changes in EEP bonuses to offset world price changes. For example, if the fixed reference price approach dictated a 20 percent decline in reference prices, then EEP bonuses would be increased by 20 percent. Not surprisingly, offsetting the decline in reference prices with increased EEP subsidies (Rule 2) raises the PSE somewhat above that generated with fixed EEP subsidies. On the other hand, when EEP subsidies are adjusted downward in response to the higher reference price, the PSE falls by more than it does in the fixed EEP subsidy case.

A third decision rule would assume that the EEP is used to achieve some targeted level of producer returns from the market. This rule would involve taking the fixed reference price and adding an EEP subsidy until the sum reached the designated producer price. A high fixed reference price would reduce EEP expenditures below actual levels, while a low fixed reference price would increase them. This approach would yield the highest revised PSE's for low reference price scenarios and the lowest revised PSE's for the high reference price scenarios.

A fourth possible decision rule would be one often enunciated by U.S. policymakers (that is, that the EEP is used to counteract the effects of unfair foreign competition). This rule would focus on the EC and its extensive use of export restitution payments, and on the EEP subsidy necessary to match the EC export price. In fact, many EEP wheat sales are made in markets which also import EC soft wheat, such as countries in Northern Africa. The appeal of this decision rule is seen in figure 5 which illustrates the close relationship between the trends in the U.S.-EC wheat price differential and the EEP bonus. Nonetheless, the U.S. has offered EEP bonuses in a number of markets where the EC is not a major competitor, so the characterization of this decision rule would not explain the entire workings of the EEP to date at least. In order to implement this rule, the EEP component of the PSE might be adjusted in order to reflect the change in the U.S.-EC price differential as indicated by the relative adjustments in their respective reference prices.

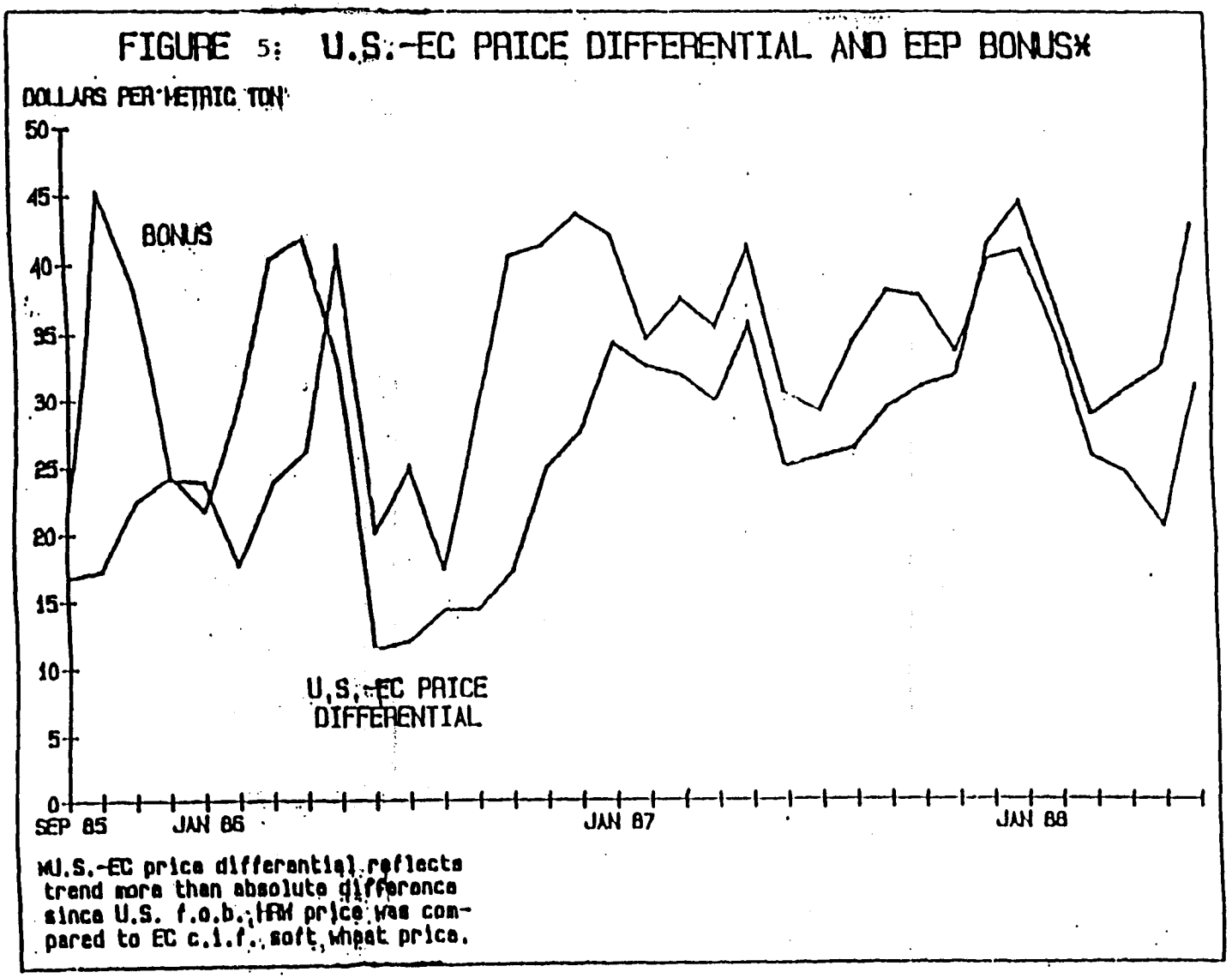


FIGURE 5: U.S.-EC PRICE DIFFERENTIAL AND EEP BONUS*
DOLLARS PER METRIC TON
50
45
40
35
30
25
20
15
10
5
0
BONUS
U.S.-EC PRICE DIFFERENTIAL
SEP 85
JAN 86
JAN 87
JAN 88
*U.S.-EC price differential reflects trend more than absolute difference since U.S. f.o.b. HRW price was compared to EC c.i.f. soft wheat price.

Source: USDA

Summary and Conclusions

The contribution of the EEP to the U.S. PSE's varies by year and commodity, but generally increased during the period we considered. For program commodities, the EEP affects other PSE components, such as deficiency and storage payments, making it difficult to assess precisely both the direct and indirect effects of the EEP on total transfers to producers. Simple graphical analysis suggests that if the EEP were eliminated the PSE would fall but not by as much as the EEP component of the PSE.

The paper also makes the point that if a fixed reference price is used an EEP decision rule must be devised in order to assess the contribution of the EEP to the PSE. In our examples using the wheat PSE, three alternative decision rules yield different PSE's when other PSE components (eg., spending on deficiency payments) are assumed to remain fixed. Decision rule 3--that the EEP component consists of the difference between the fixed reference price and the observed producer price--yields the highest PSE in the low reference price case and the lowest PSE in the high reference price case. If, for program commodities, other PSE components changed in order to compensate for changes in the EEP (for example, if deficiency payments increased if the reference price and market value of output fell), then the EEP decision rule would matter less in determining the total PSE. This point is illustrated in Appendix A where the three decision rules are applied under, first, the assumption that deficiency payments are fixed and, second, the assumption that deficiency payments vary to make up the difference between a fixed target price and a variable producer price. Nonetheless, even with this alternative assumption the EEP decision rule used determines the EEP's importance in the revised PSE.

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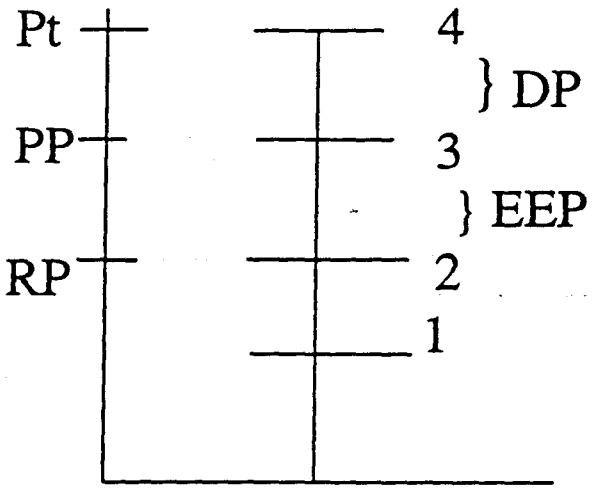
APPENDIX A

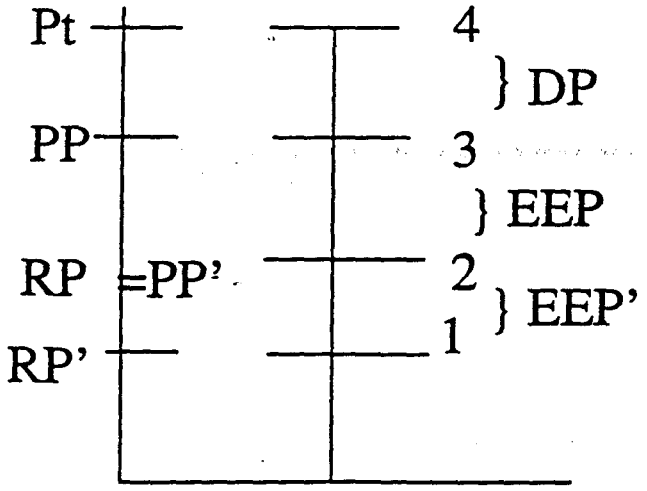
Original PSE (approximation and simplification)



$$PSE = \frac{DP + EEP}{DP + PP} = \frac{Pt - RP}{Pt} = \frac{1}{2}$$

DP=deficiency payments
Pt=target price
PP=producer price
RP=reference price

Rule 1: unchanged/reference price fixed low at RP'



PSE'(DP fixed)=

$$\frac{DP+EEP'}{DP+RP} = \frac{DP+EEP}{Pt-(PP-PP')} =$$

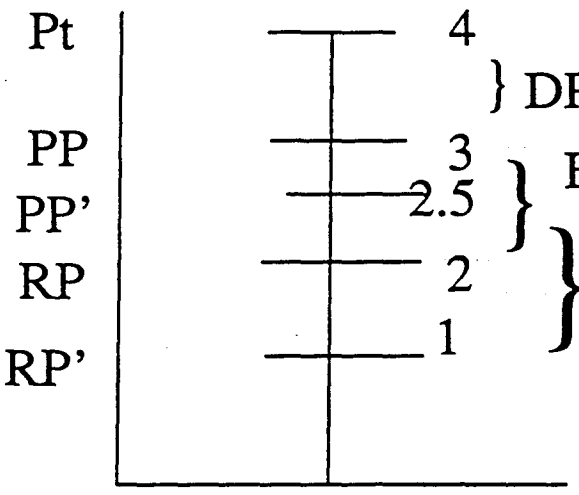
$$\frac{Pt - RP}{(Pt-(PP-PP'))} = \frac{2}{3}$$

PSE' (DP based on Pt-PP')*

$$= \frac{(Pt-PP') + EEP'}{Pt} = \frac{3}{4}$$

*Assumes PP' above loan rate.

Rule 2: EEP changed by same percent as reference price, reference price fixed low at RP'



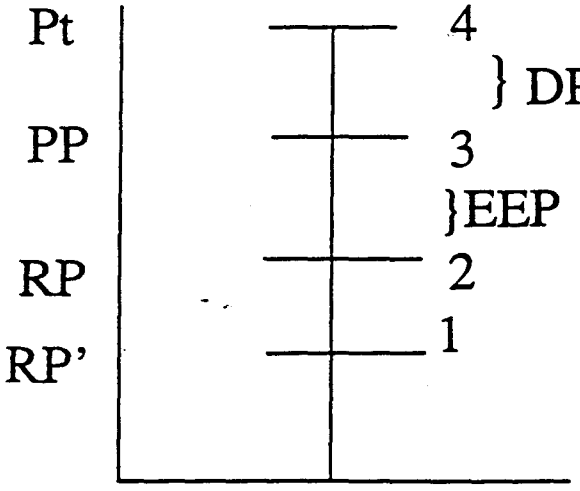
PSE'(DP fixed)

$$= \frac{DP + EEP'}{DP + PP'} = \frac{1 + 1.5}{1 + 2.5} = \frac{2.5}{3.5} = \frac{5}{7}$$

PSE'(DP based on Pt-PP')

$$= \frac{(Pt-PP')+EEP'}{Pt} = \frac{(4-2.5)+1.5}{4} = \frac{3}{4}$$

Rule 3: EEP changed to maintain original producer price, reference price fixed low at RP'



PSE'(DP fixed= Pt-PP=Pt-PP')

$$= \frac{DP + EEP'}{DP + PP} = \frac{3}{4}$$

Note: EEP' could bump against spending limits.

PSE, DECOUPLED PSE AND CREDIT FOR SUPPLY MANAGEMENT POLICIES
(application to the EC Dairy Quota Scheme)

Louis P. Mahe and Herve Guyomard

Summary

The paper proposes an approach to measure the credit/debit for policy actions, in the context of supply management policies.

The framework is based on a decomposition of the total PSE into a "Decoupled PSE" which is a non-distorting income transfer and a "Supply Inducing Equivalent" (SIE), which is the part of income transfer which is responsible for supply increase above free trade levels. The key element of decomposition is the level of the shadow price of the quota and the quasi-rent, i.e. the difference between the market price and the shadow price associated with the quota.

The method can be extended to the whole farm sector, and includes cross effects between outputs and inputs. It can also be applied to situations where some factors are rationed (set aside, fertilizer quota,...). It leads to a measure of AMS which can also be decomposed into a "Decoupled AMS" (DAMS) and a "Supply Inducing AMS" (SIAMS).

A preliminary application to policy adjustments made by the EC (including the dairy quota) since 1986 leads to an estimate of the credit - which is a change in SIE - for the dairy quota at 5.39 billion ECU (1986). When other commodities under the CAP regime are included in the analysis, the decrease in the dairy shadow price is estimated at 21 percent in real terms and the total credit that the EC could claim amounts to over 9 billion ECU of which 4.8 billion ECU is due to the quota on milk and 1.5 billion ECU is due to higher world prices.

Introduction

In spring 1989 contracting parties of the GATT agreed to give credit to countries for policy adjustments made from 1986 to 1988 in the direction of lower support of their agriculture. As policy instruments vary a lot among commodities and countries, and as world markets have been shaken by climatic conditions, the assessment of the credit to be granted for policy changes is a real challenge.

Table 0

Table 0. Estimate of credit for EC policy action, 1986 to 1988
(Summary table of results, multicommodity case)

	Dairy quota	Support price cut	World price effect	Total credit
		(million ECU, 1986)		
Dairy quota	4 844		860	5 704
other outputs				
. grains		2 850	350	3 200
. oilseeds		1 172	27	1 199
. beef		136	292	428
inputs				
. grains		-1 462		-1 462
. proteins		ε		ε
Total contribution	4 844	2 696	1 529	9069

This paper gives an approach for the case of supply management policies where policy instruments are both quantities and prices rather than prices only. The familiar notion of PSE cannot be used in a straightforward way in that case. Under a production quota the income transfer can be measured as the sum of a decoupled transfer and a supply distorting transfer. The former, later called Decoupled PSE (DPSE), corresponds to the quasi rent, and the latter corresponds to the wedge between the shadow price associated with the quota and the "World" price. This part, later called Supply Inducing Equivalent (SIE), is the income transfer, i.e. the amount of PSE which would have been just sufficient to raise production from the free trade level to the level of the quota. Using the shadow price, a very simple formula can be used to calculate the modified PSEs and the credit to be granted for policy changes.

Section 1 deals with the single commodity case and takes a rather casual approach to the treatment of credit/debit in the context of a production quota. This approach is in line with the widespread empirical calculation of the PSEs, although neither the underlying technology, nor the relation with producer's surplus are really made clear. In section 2 we present a more rigorous framework using a profit function approach. In section 3 we discuss problems of implementation and the large country case.

1. The Single Commodity- Small Country Case (PSE, DPSE, SIE)

The PSE on one commodity is in general calculated according to the formula:

$$PSE = y^{\circ} (p^{\circ} - p^{\circ}_{w}) + IS^{\circ} \qquad (1)$$

where y° is production; p° and p°_{w}, respectively supported and world prices; IS°, input subsidies which can be specific or allocated to the particular commodity. Part of $(p^{\circ}-p^{\circ}_{w})$ may correspond to budget expenditures depending on policy instruments used to provide price support.

When the commodity under consideration is subject to a production quota which is binding at the level y°, a distinction should be made between a Decoupled PSE (DPSE) and a Supply Inducing PSE (SIE, Supply Inducing Equivalent). The former transfer does not enhance the production, it is the quasi rent associated with the quota. The latter is the part of the PSE which is required to induce production just at level y° without the

quota implemented. The variation of SIE is directly related to the notion of debit/credit in which we are interested.

As illustrated on the classical figure 1 the quota is binding if

$$y^\circ < S\,[p^\circ,\ p^1,\ K] \qquad (2)$$

where S(.) is the supply function of y°, p^1 a vector of variable input prices, and K a vector of fixed factors.

There is a virtual price level μ° which would exactly bring the production level at y°,

$$y^\circ = S\,[\mu^\circ,\ p^1,\ K] \qquad (3)$$

Solving (3) for μ° defines μ° as a function of p^1, K and y°, and of input subsidies IS° in as much as they influence p^1.

$$\mu^\circ = g\,(y^\circ,\ p^1,\ K) \qquad (4)$$

With these familiar definitions, it is possible to decompose the PSE which is the total transfer into the DPSE which is only a domestic matter and the SIE which affects output and therefore trade. The DPSE is defined by the following equation.

$$DPSE = y^\circ\,(p^\circ - \mu^\circ) \qquad (5)$$

This is also the quasi-rent due to the quota. Although proportional to the level of production, it does not induce any output increase.[3]

It is not the same for the component of the PSE which is the gap between the shadow price μ° and the world price p°_w:

$$SIE = y^\circ\,(\mu^\circ - p^\circ_w) + IS^\circ \qquad (6)$$

As can be seen on figure 1, the SIE is the income transfer which, in the absence of a quota restraint, would have increased production from free trade up to y°.

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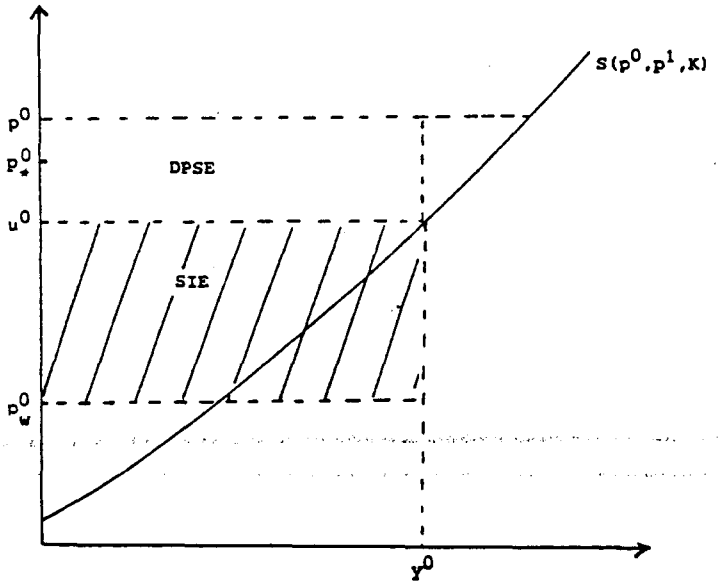
3. At least in a rather static point of view, the DPSE has no effect on the level of production. Nevertheless, as it affects income, it may eventually affect the output of resources from the farm sector and therefore production capacity. The label "Decoupled" given to the quasi-rent is also somewhat too strong in as much as the producer does have to produce y° to receive the quasi-rent.

Figure 1

Figure 1 - Decomposition of the PSE in the Decoupled Subsidy Equivalent (DPSE) and the Supply Inducing Equivalent (SIE), in the presence of a production quota.



Note : In the presence of production quotas only one part of the PSE, i.e. $y^0 (\mu^0 - p^0_w)$ where μ^0 is the shadow price corresponding to the level of the quota has an effect on production,

It is clear from (1), (5) and (6) that:

$$PSE = DPSE + SIE \qquad (7)$$

The estimate of the credit to be granted for policy action clearly depends on the interpretation of the notion of credit/debit. As the debate on PSE as opposed to TDE has shown, the PSE is an income concept which is equivalent to the amount of transfer which induces the same supply level, only under special cases where prices, taxes, subsidies, tariffs are policy instruments. From the point of view of agricultural trade relations, the real issue is the impact of policies on output, utilization and trade. This perspective leads to correct the PSE in the case where supply control measures are implemented. The evaluation of credit/debit for policy changes should therefore emphasize the SIE part of the PSE rather than the whole transfer. It is clear, as a simple case, that cutting p° down to $p^{\circ *}$ on figure 1 will have no effect on production, and therefore on trade.

a) Definition of the debit/credit (small country case $dp^\circ_w = 0$)

The credit/debit can be measured by the variation of the SIE due to changes in the level of policy instruments, which are supposed here to be p°, y°, and/or input subsidies.

The credit to be granted for effective cuts in price support can be defined as a negative variation of the SIE; a debit being an increase in the effective support SIE. A general definition of credit due to changes dy°, dIS°, dp° can be defined as follows:

$$\text{Debit} = - \text{Credit} = d\,(SIE)$$

$$\text{Debit} = y^\circ\, d\,\mu^\circ + d\,(IS^\circ) + (\mu^\circ - p^\circ_w)\, dy^\circ \qquad (8)$$

The important variable in the determination of $d\mu^\circ$ will be examined below. Clearly, if the shadow price increases as a result of policy changes the first term is positive. That would be the case if the supply function for y° shifts to the left as a result of a cost increase or a cut in subsidies. As can be seen from figure 1 also, an increase in the level of the quota would increase μ°. The algebraic sum of the three terms in (8) which may or may not offset each other, determines the eventual sign of the debit/credit.

b) Graphical illustration of credit/debit for selected policy changes

b1. An isolated reduction in the level of the quota

In that case the evaluation of the debit according to equation (8), letting $d(IS^\circ) = 0$, gives:

$$\text{Debit} = y^\circ d\mu^\circ + (\mu^\circ - p^\circ_w)\, dy^\circ$$

where $d\mu^\circ = (\partial\mu^\circ/\partial y^\circ)dy^\circ$ is calculated along the supply curve given by (3).

In the case of a reduction dy° of the level of allowed quota (by dy°), the shadow price falls by $d\mu^\circ$ and the PSE will decrease by area (b + c), which is an approximation of the income effect. But the equivalent income effect which would have produced the same supply reduction is given by area - (a+c). It is clear that the component a is just shifted from the SIE to the DPSE and is not inducing supply any more. Area a should be considered as the appropriate measure of the credit obtained from quantity restriction. Area (a + c) could also be used to follow the more traditional calculation of PSE.

Note that the presence of area c under the supply curve, which represents the cost saved when output is reduced, is an artifact of the practical implementation of PSE calculations. If the producer's surplus rather than the PSE was used, area c would not be included in d(PSE) nor in d(SIE). In section 2, where a more rigorous approach is used in the evaluation of AMS, the contribution of the good under quota to the aggregate credit will only be area a (when only the quota level is altered).

b2) The credit due to a support price cut of the good, subject to quota is zero.

Expression (5) shows that a change dp° has an impact on DPSE of $y^\circ dp^\circ$ but no effect on SIE as can be seen from expression (6), where p° does not appear.

Figure 3 illustrates the simple case of a price cut by dp° smaller than the wedge between p° and μ°. The only effect is a cut in the decoupled transfer by area a. There is no credit to be gained from such an action if the concept of trade distorting equivalent or supply inducing equivalent is the one chosen. If however political economy considerations

Figure 2

Figure 2 - Change in SIE and credit/debit estimate (case of a change in quota level)

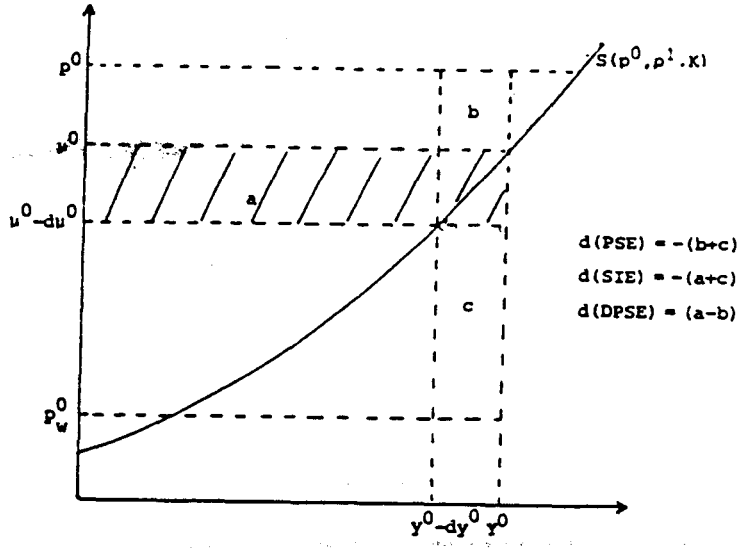


Figure 3

Figure 3 - Credit and support price cut under a constant level of quota

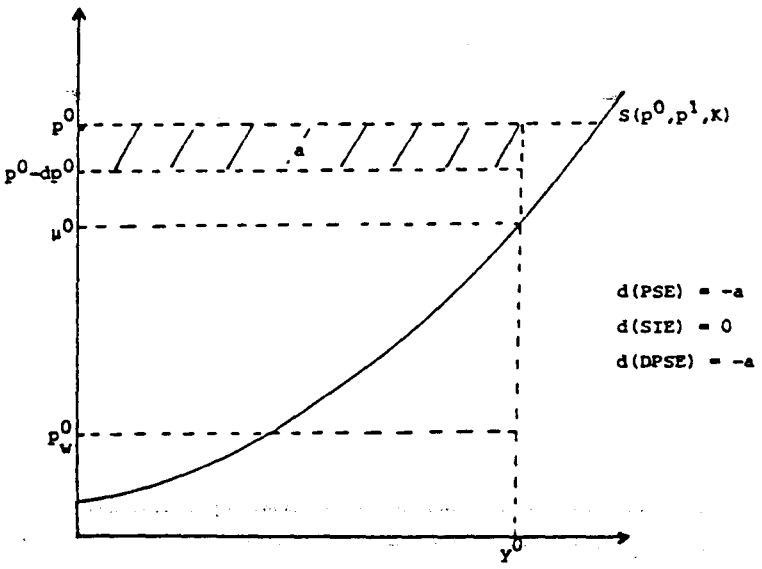
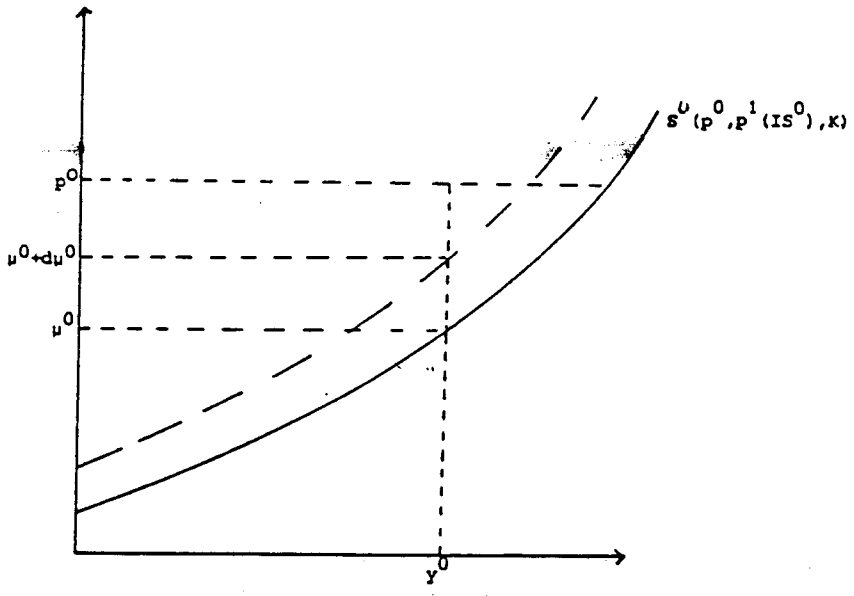


Figure 4

Figure 4. Effect of a decrease in input subsidy on the credit



or inefficiencies due to the artificially created asset value of quota rights are taken into account, some weighted sum of (DPSE) and (SIE) might be considered, with the heavier weight placed on SIE.

b3) A change in input subsidies

From expression (7), when only d(IS°) is different from zero, the debit amounts to:

Debit = $d(SIE) = y^{\circ}\, d\mu^{\circ} + d(IS^{\circ})$

where, $d\mu^{\circ} = (\partial\mu^{\circ}/\partial p^{1}).\ (\partial p^{1}/\partial IS^{\circ}).d(IS^{\circ})$

It can be noted in this case that the two components of d(SIE) have opposite signs under normal input conditions since one expects that $\partial\mu^{\circ}/\partial p^{1} > 0$ and $\partial p^{1}/\partial IS^{\circ} < 0$, i.e. a positive effect of input prices on marginal cost and a negative effect of subsidies on input prices.

This change in IS° will have an effect on both DPSE and SIE. The change in DPSE is only a function of the shadow price, which is shifted to or from SIE. But the change in SIE is the negative of the latter plus the change in input subsidies. The sum of the two components, i.e. d(PSE), will therefore be affected by the input subsidy change as can also be seen directly from equation (1).

c) Estimation of the shadow price change

In order to use expression (8), we need to know the initial level of the quota and the gap between the shadow price and the free trade or no policy price p°_{w}. We also need to estimate the change in the shadow price $d\mu^{\circ}$.

When there is a market for quota rights or for rented quotas, the gap between support price p° and shadow price μ° can be estimated on that basis, as well as changes in the level of the shadow price over time.

In the case of EC where a real market for quotas does not exist in most countries,[4] we will use a different approach based on the idea that in 1983, before the implementation of the quota, support or rather market price and marginal cost (i.e. shadow price) were equal. Then the simple comparative statistics of the dairy supply function will provide an estimate of the shadow price change from 1984 to 1988.

The shadow price change is obtained from the comparative statistics of the supply function (3), with technical change included and y° the new policy instrument instead of p°. [The shadow price is now endogenous].

$$dy^\circ = \frac{\partial S}{\partial \mu^\circ} d\mu^\circ + \sum_i \frac{\partial S}{\partial p^1_i} dp^1_i + \frac{\partial S}{\partial t} dt + \sum_j \frac{\partial S}{\partial K_j} dK_j \qquad (9)$$

This expression can be easily written in terms of own supply elasticity E_{oo} and cross elasticities; with respect to variable input prices $E_{oi} = \partial \log S / \partial \log p^1_i$; with respect to technical change $E_{ot} = \partial \text{Log} S / \partial t$, and with respect to quasi-fixed inputs $E_{oj} = \partial \text{Log}\, S / \partial \text{Log}\, K_j$. Denoting by $\hat{x} = d\log x$, a relative change:

$$\hat{y}^\circ = E_{oo} \hat{\mu}^\circ + \sum_i E_{oi} \hat{p}^1_i + E_{ot}\, dt + \Sigma_g E_{oj} \hat{K}_j \qquad (10)$$

Since the shadow price μ° is now endogenous, (10) must be solved for $\hat{\mu}^\circ$ in function of exogenous variables $\hat{y}^\circ$, $\hat{p}^1$, dt and $\hat{K}$.

$$\hat{\mu}^\circ = (E_{oo})^{-1} \cdot (\hat{y}^\circ - \sum_i E_{oi} \hat{p}^1_i + E_{ot}\, dt + E_{oj} \hat{K}_j \qquad (11)$$

Since the supply function is homogenous of degree zero in prices, $E_{oo} + \Sigma E_{oi} = 0$ and μ° is homogenous of degree one in variable input prices p^1_i. If price changes are nominal the shadow price cut is also nominal, and similarly for real changes.

This expression shows how both shifts of the supply curve and moves along this curve determine the shadow price. As E_{oo}, the own price supply elasticity, is positive, a reduction in the level of the quota drives the

---

4. In section 3 where practical matters will be discussed further, the results of the method used will be compared with the partial information available on quota values.

shadow price down. Both a positive technical change bias and an input price fall work in the same direction under normal conditions. Such changes will tend to give credit for policy adjustment under quota. However the flow of fixed or primary factor K_j out of the industry at rate $\hat{K}_j > 0$, as one would expect to be the case in the farm sector, will tend to slow down the fall of the shadow price.

As can be seen from table 1, the main contributing factors to the fall in the shadow price from 1986 to 1988 are the cut in the level of the quota and the rate of technical change. When the deflated shadow price is considered, the contribution of input prices is also significant (about -7 percent). The decrease in primary factor use works as expected in the opposite direction and has reduced the amount of credit that can be requested from the dairy quota.[5] However technical change bias on quasi-fixed inputs (labor and capital) more than offsets the outflow of resources from the sector (Mahe, Guyomard 1989). These estimates will be set in wider perspective below, since policy changes carried out in the EC since 1986 have not dealt only with the dairy sector.

2. The multi-commodity case (small country)

The previous approach can be extended to the whole farm sector in order to decompose an Aggregate Measure of Support (AMS) into two components: a Decoupled Aggregate Measure of support (DAMS) and a Supply Inducing Aggregate Measure of Support (SIAMS). In the multi-commodity case, that is in the multi-input, multi-output case, cross effects between outputs and inputs should be taken into account. The AMS change must include the credit/debit on commodities under quota and the others for which support prices have been adjusted.

The different measures of support can be defined directly from production theory, on the basis of several relevant concepts of profit functions. The formulas which are eventually used in the implementation, are quite simple and can be understood intuitively without reading the derivations below.

5.The supply elasticities used to estimate this change from equation (11) are derived from the MISS model, as revised in Mahe-Guyomard (1989).

Table 1

Table 1 - Provisional Estimate of Milk shadow price change and credit due to quotas in EC-10 (1987-88) (single commodity - small country case)

1. Estimation of shadow price variation (per cent)

Contributing factor	change in factor (per cent)	impact in nominal terms (per cent)	impact in real terms (per cent)
quota	- 8.5	- 9.4	-9.4
technical change	3.1	- 3.45	-3.4
variable inputs prices	-	+ 1.13	-6.8
quasi-fixed inputs quantities	-	- 0.46	-0.46
Total shadow price variation			
nominal		-12.2	-
deflator		7.9	-
deflated		-20.1	-20.1

2. Estimation of credit in terms of SIE decrease

1986 quota (million tonnes)		99
1986 price[1] (ECU/tonne)		278
1986 shadow price (Ecu/t)		233
credit (million ECU)		
	$y^{*}d\mu^{*}$	4613
	$(\mu^{*}-p^{*}_{v})dy^{*}$	783
	Total	5396
credit (million ECU)		

[1] see annex I where the cumulative evolutions of nominal, shadow and observed, prices of milk are plotted.

For a firm facing exogeneous market prices (v^1, v°), but with some netputs constrained at level q° several notions of profit functions are useful to assess income transfers due to various changes in exogeneous variables. The first is the unconstrained or long-run total profit function corresponding to the case where all netputs are free to adjust to their optimal level.

$$\Pi^u (v^1, v^\circ) = \underset{(q^1, q^\circ)}{\text{MAX}} \; [v^1.q^1 + v^\circ. q^\circ; (q^1, q^\circ) \in T] \qquad (12)$$

where [6] q^1 is the vector of netputs free to vary, with corresponding prices v^1 and likewise for quota and restricted inputs, q° and v°.

The second is the constrained or short-run total profit function which corresponds to the constrained profit actually received under rationing. It is the sum of the restricted profit and the value of fixed netputs at market prices.

$$\Pi^c (v^1, q^\circ, v^\circ) = \Pi^r (v^1, q^\circ) + v^\circ q^\circ \qquad (13)$$

where $\Pi_r (v^1, q^\circ)$ is the restricted or variable profit function defined by

$$\Pi^r (v^1, q^\circ) = \underset{(q^1)}{\text{Max}} \; [v^1 q^1; q^1 \in T (q^\circ)] \qquad (14)$$

The third is the virtual or shadow total profit function, which is the one received by the firm if it were facing v^1 for variable netputs and the shadow prices μ° for the constrained ones..

$$\Pi^v (v^1, q^\circ, \mu^\circ) = \Pi^u (v^1, \mu^\circ) = \Pi^r (v^1, q^\circ) + \mu^\circ q^\circ \qquad (15)$$

where, by Hotelling's lemma, $\mu^\circ = -\partial \Pi^r (v^1, q^\circ)/\partial q^\circ$, which defines the virtual price as a function of variable netput prices and the level of quotas. μ° does not depend on actual support price v° but actual profit Π^c (.) does. It should be noted that when all netputs are in equilibrium $\Pi^u = \Pi^c = \Pi^v$. Furthermore, the constrained profit function Π^c (.) may be also written by using (15) as,

$$\Pi^c (v^1, q^\circ, \mu^\circ) = \Pi^u (v^1, \mu^\circ) + (v^\circ - \mu^\circ).q^\circ \qquad (16)$$

---

6. Transposed vectors are not explicitly indicated as it is clear that v.q is the inner product. Matrix operations below are also written without the transpose sign.

From these definitions, an AMS is simply defined as the difference between the constrained profit function evaluated at this point (v^1, q°, v°) where prices are supported at (v^1, v°) and some netputs are restricted at q° and the unconstrained profit function evaluated at world prices (v_w^1, v_w°)

$$AMS = \Pi^c (v^1, q^\circ, v^\circ) - \Pi^u (v_w^1, v_w^\circ) \quad (17)$$

$$= \Pi^r (v_1, q^\circ) - v^\circ q^\circ - \Pi^u (v_w^1, v_w^\circ) \quad (18)$$

$$= \Pi^u (v^1, \mu^\circ) - \mu^\circ q^\circ + v^\circ q^\circ - \Pi^u (v_w^1, v_w^\circ)$$

$$= [\Pi^u (v^1, \mu^\circ) - \Pi^u (v_w^1, v_w^\circ)] + [(v^\circ - \mu^\circ) q^\circ] \quad (19)$$

$$= [SIAMS] + [DAMS] \quad (20)$$

In the case of a small country, that is assuming $dv^1_w = dv^\circ_w = 0$, the variation of the aggregate measure of support is obtained by total differentiation of $\Pi^c (v^1, q^\circ, v^\circ)$ i.e.

$$d(AMS) = d\Pi^c (v^1, q^\circ, v^\circ)$$

$$= \partial\Pi^c/\partial v^1 \cdot dv^1 + \partial\Pi^c/\partial q^\circ \cdot dq^\circ + \partial\Pi^c/\partial v^\circ \cdot dv^\circ \quad (21)$$

This differentiation may be also written using (18) as.

$$d(AMS) = (\partial\Pi^r/\partial v^1) dv^1 + (\partial\Pi^r/\partial q^\circ)\, dq^\circ + v^\circ \cdot dq^\circ + q^\circ \cdot dv^\circ$$

$$= (\partial\Pi^r/\partial v^1) dv^1 + q^\circ\, dv^\circ + [v^\circ - \mu^\circ(v1, q^\circ)]\, dq^\circ$$

$$= q^1\, dv^1 + q^\circ dv^\circ + [v^\circ - \mu^\circ (v^1, q^\circ)]\, dq^\circ \quad (22)$$

Differentiating the alternative expression of Π^c, i.e. equation (16), we obtain

$$d(AMS) = d\Pi^c (v^1, q^\circ, v^\circ)$$

$$= d\Pi^u (v^1, \mu^\circ (v^1, q^\circ)) + d((v^\circ - \mu^\circ) \cdot q^\circ)$$

$$= d(SIAMS) + d(DAMS)$$

The variation of the AMS is the sum of two components: (i), the variation of the SIAMS which measures supply inducing aggregate measure of support effects and (ii), the variation of the DAMS which has no impact on supply. The variations of both measures may be written as a function of exogeneous or control variables (v^1, q°, v°)

$$d(SIAMS) = d\Pi^u (v^1, \mu^\circ (v1, q^\circ))$$

$$= (\partial\Pi^u/\partial v^1) dv^1 + (\partial\Pi^u/\partial\mu^\circ) [(\partial\mu^\circ/\partial v^1)\, dv^1 + (\partial\mu^\circ/\partial q^\circ) dq^\circ]$$

$$= q^1 . dv^1 + q^\circ [-(\partial^2\Pi^r/\partial q^\circ \partial v^1)\, dv^1 - (\partial^2\Pi^r/\partial q^\circ \partial q^\circ) dq^\circ] \quad (23)$$

$$d(DAMS) = d[(v^\circ - \mu^\circ) q^\circ]$$

$$= (v^\circ - \mu^\circ)\, dq^\circ + q^\circ (dv^\circ - d\mu^\circ)$$

$$= (v^\circ - \mu^\circ)\, dq^\circ + q^\circ\, dv^\circ - q^\circ [-(\partial^2\Pi^r/\partial q^\circ \partial v^1)\, dv^1 - (\partial^2\Pi^r/\partial q^\circ \partial q^\circ)\, dq^\circ] \quad (24)$$

The importance of this decomposition is illustrated in figures 5 to 7 where only one exogeneous variable changes at a time, the other instrument variables being held constant. To make the results more transparent and easier to interpret, we consider the case of a single rationed output.

a) Change in quota level

First, let us consider the case where the quota level q° varies from q° to $q^\circ + dq^\circ$ (figure 5). Then the variation of the AMS, (holding $dv^1=dv^\circ=dv^1_w=dv^\circ_w=0$) is by (22),

$$d(AMS) = (v^\circ - \mu^\circ (v^1,q^\circ))dq^\circ$$
$$= d(SIAMS) + d(DAMS)$$
$$= q^\circ[-(\partial^2\Pi^r/\partial q^\circ \partial q^\circ).dq^\circ] + [(v^\circ - \mu^\circ (v^1,q^\circ))dq^\circ + q^\circ(\partial^2\Pi^r/\partial q^\circ \partial q^\circ).dq^\circ] \quad (25)$$

On figure 5 dealing with the market for output q°, the variation in the aggregate measure of support is given by the area -a; d(SIAMS) is given by the area -(b+c+d) and d(DAMS) is represented by -a+(b+c+d).

b) a change in support price only

The second example is simpler and corresponds to a variation of the market price v° of the output under quota. The variations of the three measures of aggregate support are now written as

$$d(AMS) = q^\circ\, dv^\circ = d(DAMS)\ ;\ d(SIAMS) = 0 \quad (26)$$

In such a case, d(SIAMS) is equal to zero since Π^u evaluated with v^1 and μ° does not depend on v° as long as the quota is binding, i.e. as long as the shadow price μ° is lower than the support price v°. This case is illustrated by figure 6.

c) a change in variable netput prices

The third particular case corresponds to a change of a market price v^1 of the unconstrained output q^1, other instrument variables being held constant. This case results in

$$dAMS = q^1\, dv^1$$
$$= [q^1\, dv^1 + q^\circ\, \partial\mu^\circ/\partial v^1\, dv^1] - [q^\circ\, \partial\mu^\circ/\partial v^1\, dv^1] \quad (27)$$
$$= d(SIAMS) + d(DAMS)$$

Figure 5

Figure 5. AMS, SIAMS and DAMS variations in the case of a decrease in the level of the production quota ($dv^1 = dv^0 = dv^1_w dv^0_w = 0$)

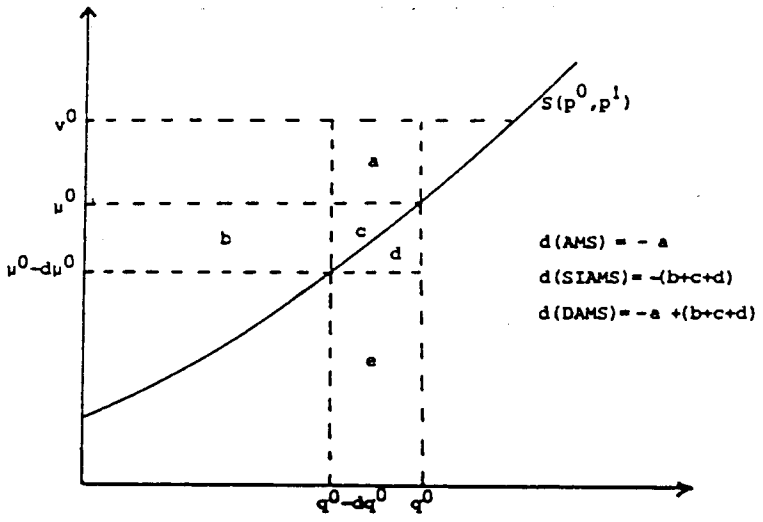


Figure 6

Figure 6. AMS, SIAMS and DAMS variations in the case of a change in the market price of the output under quota ($dv^1 = dq^0 = dv^1_v = dv^0_v = 0$)

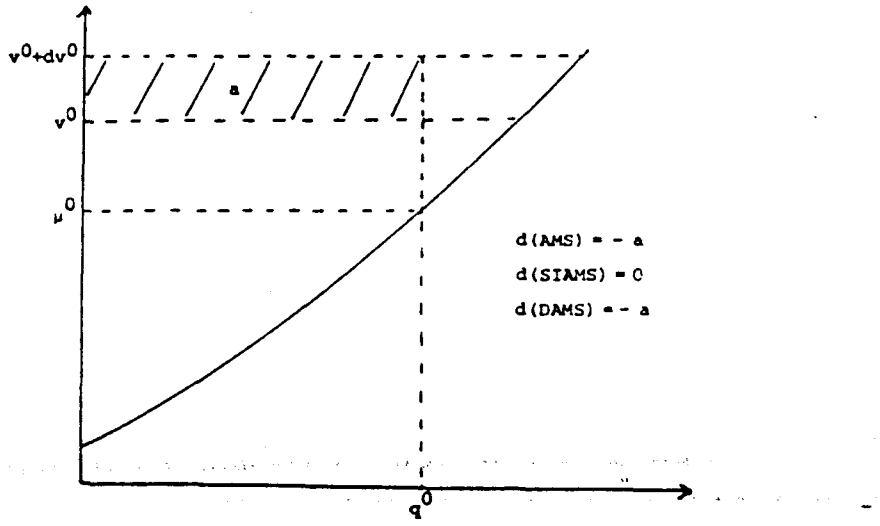


Figure 7

Figures 7 : AMS, SIAMS et DAMS variations in the case of a change in the market price v^i of an unconstrained output q^i.

Figure 7a.

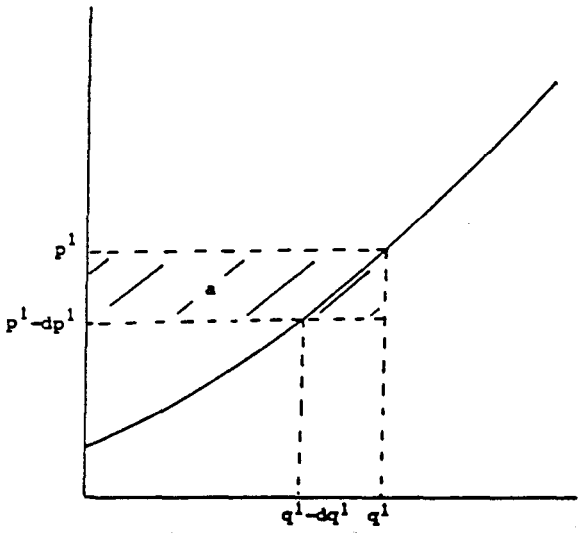
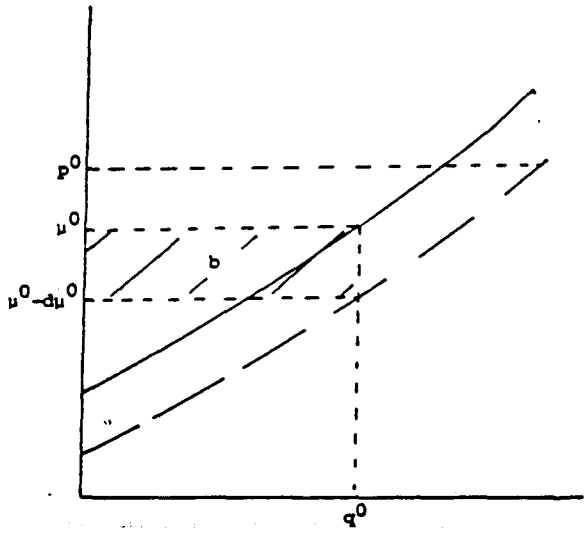


Figure 7b.



d(SIAMS) is represented by the area a on figure 6a corresponding to the output q^1 market plus the area b on figure 3b corresponding to the output q° market; d(DAMS) is represented by the area -b on figure 7b.

To conclude, a very simple expression based on expression (23) can be used to evaluate the overall debit, when the relevant shadow prices are estimated (see annex II). Using y^2_1 for outputs (prices p^1_i), x^1_j for inputs (prices w^1_j) and y° for the quota (shadow price μ°),

$$\text{Debit} = - \text{credit} = d(\text{SIAMS}) = \Sigma y^1_i \, dp^1_i + y^\circ \, d\mu^\circ - \Sigma \, x^1_j \, dw^1_j \quad (28)$$

3. Empirical issues, terms of trade and assessment of results

The analytical expressions presented in the previous sections provide a simple way to calculate the debits and credits, when the effects of policy actions on prices are known. This raises at least three issues (i) the actual contribution of policy action to observed changes in prices received and paid by producers (ii) the measurement of shadow price changes (iii) the impact of policy action on world prices which may also contribute to a decrease in the SIAMS when support is cut and prices move up on world markets.

(i) Contribution of policy changes to observed market prices

No perfect answer can be provided to this question as part of the observed changes in output and input prices is due to the reduction in price support, but part is also due to changes in the general economic outlook; and in the case of tariff-ridden commodities world market fluctuations are the main cause for price changes on the domestic market.

In the empirical assessment of the debit/credit for EC policy changes we have kept in the calculation only the components of change in supply inducing income support which can be easily connected with actual EC policy changes. As can be seen in table 2, the effects of observed and shadow price changes are included into the credit only for grains, oilseeds, beef, dairy and sugar on the output side and only for grains on the variable input side. The dramatic change in pork and poultry prices, the reduced price of the sub aggregate "rest of agriculture", and the change in intermediate input cost are not included as they are not considered as consequences of policy adjustments from 1986 to 1988 but rather as results of the general economic situation.

Table 2. Summary of credit for policy measures in EC from 1986 to 1988 (million ECU, 1986)

	actual or shadow[1] price variation nominal (per cent)	deflated (per cent)	support or shadow price cut (million ECU, 1986)	inclusion in the debit measure
. unconstrained outputs			$y^i_1 dp^i_1$	
grains	- 3.7	- 11.6	- 2 850	yes
oilseeds	- 15.5	- 23.4	- 1 172	yes
beef	+ 7.4	- 0.5	- 136	yes
pork and poultry	- 12.6	- 20.5	- 4 692	no
. rest of agriculture	3	- 4.9	- 219	no
. outputs under quota			$y^q_1 d\mu^q_1$	
dairy[2]	- 13.1	- 21	- 4 844	yes
sugar[2]	-	-	-	-
. inputs			$-x^j_1 dw^j_1$	
grains	- 3.7	- 11.6	+ 1 462	yes
proteins	- 5.9	- 13.8	+ 464	no
milk feed	6.4	- 1.5	+ 20	no
other feed	- 0.8	- 8.7	+ 22	no
other int. consumpt	+ 1.9	- 6	+ 244	no
Debit = total change in SIAMS (small country)				- 7 540
World price change effect				- 1 529
Debit = total change in SIAMS (large country)				- 9 069

[1] Sugar contribution to the credit was judged to be small and negligible..

It should be noted however, that when an output is regulated by a quota, the changes in cost, technical progress and market conditions contribute indirectly to the credit. As dairy and sugar are prevented from expanding as a result of e.g. technical change, there is an equivalent cut in support price which should be included since it is due to the role of the restriction on output in preventing market conditions to influence the level of supply.

(ii) Measurement of shadow price changes

The method used above in the estimation of shadow price changes depends on the parameters of the supply equation. In order to check the order of magnitude, casual or quoted information on prices of quota rights for rent or for sale were used.

The estimates quoted in table 3 are rather casual in most cases. However, the orders of magnitude are not so far away from our estimate for the whole of EC-10, which amounts to a decrease in shadow price of about 6 percent from 1983 to 1986 and a further 21 precent from 1986 to 1988 (annex I).

(iii) terms of trade effects of policy adjustment.

The general decomposition of the AMS given in section 2 was:

$$AMS = [\Pi^u (v^1, \mu^\circ) - \Pi^u(v^1_w, v^\circ_w)] + (v^\circ - \mu^\circ) q^\circ$$
$$= SIAMS + DAMS$$

Up to now we have discussed the effect of policy changes on $\Pi^u (v^1,\mu^\circ)$. If there are policy instruments g_n ($n = 1, \ldots N$), this effect can be written as the total differential of the virtual profit function around domestic and shadow price level, $d\Pi^u (v^1,\mu^\circ) = \Sigma_n (\partial\Pi^u (.) / \partial g_n) dg_n$

Likewise the terms of trade effect of policy changes in EC, has increased the level of the virtual profit function at world market prices, $d\Pi^u (v^1_w,v^\circ_w) = \Sigma_n (\partial\Pi^u (.) / \partial g_n) dg_n$

In order to discover the magnitude of the second effect, the MISS model (Mahe, Tavera et Trochet, 1988; Guyomard, Mahe, Tavera et Trochet, 1988) was used to assess the impact of policy changes on world prices. Table 4

summarizes the outcome of implementing these changes in support prices (grains, oilseeds, beef) and in the dairy quota.

table 3

Informal estimates of leasing or selling prices of quota rights (1988)

	rental price	sales price	support price	rate of quasirent as per cent of support price[5]
United Kingdom (£/l.) (Burrel, 1989)	0.06	0.034[1]	0.16	21-37 p.c.
Ireland (If/l.) (Conway, 1989)	0.036		0.20	18.0 p.c.
Netherlands[2] (Hfl/l.)		3	0.75	40.0 p.c.
Denmark[3] (D. Kr/l.)		4.5	2.0	22.5 p.c.
France[4]				25-40 p.c.

Sources :

[1] Calculated on the basis of the quoted quota price of 1.700 $ per cow and informal inquiry.
[2] personal interview
[3] personal interview
[4] estimates from cost function and from a similar method as used here (Guyomard, Mahé 1989)
[5] When a sales price was the data, a 10 percent discount rate was applied.

table

Table 3. Terms of trade effects and increase in farm income at world market prices.

function $d\Pi^s(v^1_w, v^0_w)$	world price change (per cent)	change in profit at world prices (millions ECU,1986)
grains	+ 2.4	350
oilseeds	+ 0.6	27
beef	+ 1.9	292
dairy	+ 5.9	860
sugar	+ 0.3	-
pork and poultry	-	-
rest of agriculture	-	-
Total agriculture	-	1 529

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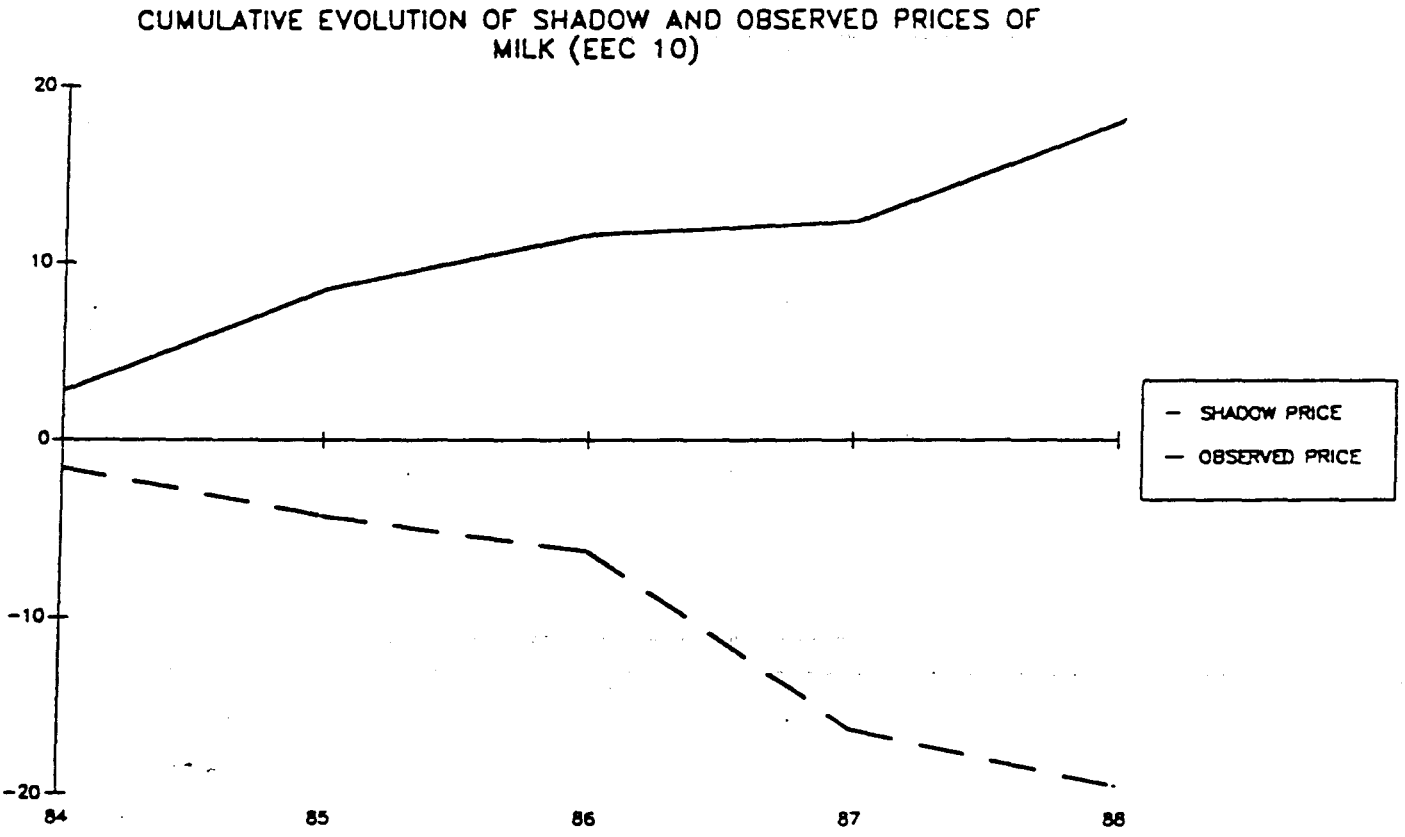
ANNEX I.


CUMULATIVE EVOLUTION OF SHADOW AND OBSERVED PRICES OF MILK (EEC 10)
20
10
0
-10
-20
84
85
86
87
88
SHADOW PRICE
OBSERVED PRICE

ANNEX II.

This appendix is based on Mahe, Guyomard (1989) and Guyomard, Mahe (1989).

When all prices are given and producers are free to adjust immediately, the familiar producer problem is:

$$\underset{(q)}{\text{Max}}\ [vq;\ q\ \varepsilon\ T] = \Pi^{u}(v) \qquad (a)$$

where q is the vector of (n+m) netputs quantities, v the vector of corresponding prices and $\Pi^{u}(v)$ the (unconstrained) profit function. The feasible set T is assumed strictly convex so that optimal quantities are uniquely determined and well behaved function of prices. The vector q is partitioned into two subvectors of quantities q^{1} always variable and quantities q^{o} susceptible of being constrained. A similar subdivision applies to the vector of prices v. Problem (a) may then be written as:

$$\underset{(q^{1},\ q^{o})}{\text{Max}}\ [v^{1}q^{1} + v^{o}q^{o}\ ;\ (q^{1},\ q^{o})\ \varepsilon\ T] = \Pi^{u}(v^{1},\ v^{o}) \qquad (b)$$

The complete system of supply response can be written in terms of the Jacobian of this unconstrained profit function

$$\begin{bmatrix} dq^{1\,u} \\ dq^{o\,u} \end{bmatrix} = \begin{bmatrix} \Pi^{u}_{v1vo}(v^{1},\ v^{o}) & \Pi^{u}_{v1vo}(v^{1},v^{o}) \\ \Pi^{u}_{vov1}(v^{1},\ v^{o}) & \Pi^{u}_{vovo}(v^{1},v^{o}) \end{bmatrix} \begin{bmatrix} dv^{1} \\ dv^{o} \end{bmatrix} \qquad (c)$$

When quantities are pegged at say q^{o} by policy instruments (production quotas, set-aside,...), variable quantities do not behave in the same way with respect to exogeneous prices v1, since they are also a function of fixed quantities q^{o}. Define μ^{o} the vector of virtual prices, which ensure that the unconstrained quantities q^{ou} as functions of prices will stay at level q^{o}, by:

$$q^{ou}(v^{1},\ \mu^{o}) = q^{o} \qquad (d)$$

Solving (d) for the virtual prices μ^{o} as function of v^{1} and q^{o}, we can define the relationship between the restricted behavioral functions[7] $q^{1r}(.)$ and the unconstrained functions $q^{1u}(.)$.

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7. When some netputs q^{o} are fixed at q^{o}, the constrained producer problem is written as: $\max\ [v^{1}q^{1}\ ;\ q^{1}\ \varepsilon\ T(q^{o})] = \Pi^{r}(v^{1},\ q^{o})$. Supply and demand equations for variable netputs q^{1} are then given by $q^{1r}(v^{1},\ q^{o}) = \partial\Pi^{r}(v^{1},\ q^{o})/\partial v^{1}$.

$$q^{1r}(v^1, q^\circ) = q^{1u}[v^1, \mu^\circ(v^1, q^\circ)] \qquad (e)$$

Differentiating (d) and (e) yields

$$\begin{bmatrix} dq^1 \\ dq^\circ \end{bmatrix} = \begin{bmatrix} \overset{u}{\Pi}_{v1v1}(v^1, \mu^\circ) & \overset{u}{\Pi}_{v1vo}(v^1, \mu^\circ) \\ \overset{u}{\Pi}_{v1vo}(v^1, \mu^\circ) & \overset{u}{\Pi}_{vovo}(v^1, \mu^\circ) \end{bmatrix} \begin{bmatrix} dv^1 \\ dv^\circ \end{bmatrix} \qquad (f)$$

The cross partial derivatives of Π^u are evaluated at the point (v1, q°), i.e. (v1, μ°(v1,q°)). The comparative statics of the constrained regime is obtained by solving (f) for the actual endogenous variables (dq^{1u}, $d\mu^\circ$) with respect to the new set of exogenous ones which are (dv^1, dq°), that is

$$\begin{bmatrix} dq^1 \\ d\mu^\circ \end{bmatrix} = \begin{bmatrix} \overset{u}{\Pi}_{v1v1} - \overset{u}{\Pi}_{v1vo}(\overset{u}{\Pi}_{vovo})^{-1}\overset{u}{\Pi}_{vov1} & \overset{u}{\Pi}_{v1vo}(\overset{u}{\Pi}_{vovo})^{-1} \\ -(\overset{u}{\Pi}_{vovo})^{-1}\overset{u}{\Pi}_{vov1} & (\overset{u}{\Pi}_{vovo})^{-1} \end{bmatrix} \begin{matrix} dv^1 \\ dq^\circ \end{matrix} \qquad (g)$$

The virtual price changes are analyzed using the second row of (g): these changes may equivalently be written in terms of unconstrained price elasticities.

$$\hat{\mu}^\circ = -(E_{oo})^{-1} E_{o1} \cdot \hat{v}^1 + (E_{oo})^{-1} \hat{q}^\circ \qquad (h)$$

where $\hat{\mu}^\circ$, $\hat{v}1$ and $\hat{q}^\circ$ are the vectors of percentage changes in virtual prices, unconstrained netput prices and fixed netputs respectively; and E_{oo} and E_{o1} are the matrices of price elasticities of netputs q° under unconstrained regime. Technical change effects may also be included (for more details, see Guyomard and Mahe, 1989).

SELLING CAP REFORM IN TRADE NEGOTIATIONS

Fabrizio De Filippis and Luca Salvatici*

1. Introduction

The current debate about the opportunity of including an AMS in the eventual Uruguay Round agreement on agriculture has promoted the development of several indicators. Most of them are based on the PSE framework and the political discussion seems to focus on this indicator. Up to now three major problems related to an AMS have emerged during the negotiations:

i) the volatility of the world reference price;
ii) the inclusion of the structural ("decoupled") measures;
iii) the concessions of "credits" for supply control measures.

The last point is of great importance for the European Community since a managed supply reduction seems to be the main feature of the CAP reform which has been conceived and implemented during the 1980s.

In this paper we address the issue of how the new instruments introduced in the CAP (quota, set-aside, "stabilizers") can be handled in a AMS approach. In particular we focus on the conceptual problems of bringing supply control policies under the PSE, in the next section the policies implemented by the EC Commission within the process of CAP reform will be recalled briefly. The problem of including such measures in the PSE calculations is discussed in section 3 through a comparative graphical analysis of the differences among various policies. Section 4 contains data on the present degree of adoption of the set-aside mechanism and highlights the small relevance of this policy. Finally, some tentative conclusions are developed to recall our main results and to point out the critical issues presently under negotiations.

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2. The CAP Reform

Viewed from the evolution undergone by the CAP, supply measures includes mandatory (quota systems) or optional regulations (set-aside, extensification, pre-retirement), while budget measures include actions like co-responsibility levies and financial stabilizers. Initially these two approaches have been used jointly as in the case of sugar regime, which allows export restitutions paid through a co-responsibility levy, only to a quota part of the production. Successively, during the 1980s, the quota approach has been applied to the milk sector with the decision of March 1984, now generally considered as the turning-point of the CAP. More recently the focus has been put on the budget measures with the stabilizers regime and with a wider use of co-responsibility levies.

A brief illustration of the most important policies (quotas, optional regulations, co-responsibility-levies, financial stabilizers), is sufficient for our purpose. Since most of them are well known, our discussion will be focused mainly on some peculiar characteristics, relevant for the analysis carried out in the next section.

A. Quotas

Quotas are the most straightforward instrument of supply control as they bind the global production to a fixed quantity. Their relative simplicity from the conceptual point of view and their undoubted effectiveness have suggested a large use of this policy. The principal products subject to quotas are milk and sugar, which constitute 20% of the agricultural gross output in the Community.

The main characteristic of quotas is that they guarantee a fixed price for a bound quantity. If the ceiling is overflowed there is a sharp reduction in the price received on the excess quantity produced. This reduction could be proportional to the amount of the overflow, as in the case of sugar, or fixed, as in that of milk but the crucial point is that the price received within the quota is not subject to uncertainty.

Finally, it should be pointed out that in this case the emphasis is placed only on the physical quantities. In fact, as far as international trade is concerned, the size of the gap between domestic and world prices is not of great significance; what really matters is the difference between the quota and the quantity that would have been produced in a free-trade

scenario. Therefore if quota policies are allowed, negotiations should focus on the level of output and we will argue in the next section that this conclusion makes the calculation of an AMS redundant or even misleading.

B. Optional regulations

Optional regulations include those policies - like set-aside, extensification and pre-retirement schemes - that provide benefits for the farmers who agree to take decisions consistent with the objective of curbing production. Obviously, the impact of such policies is much less certain than in the case of quotas, but both are part of a "quantity-oriented" strategy in tackling the problems of saturated markets. While quotas bind the final output, the optional policies impinge on factors of production (especially land) in order to reduces their use.

There is no need to stress that the effectiveness of these kinds of policies is uncertain, depending on the behavior of farmers and on the impact of technical progress and extension. In the case of the EC the situation is worsened by the fact that these schemes are financed within the structural policy of the EC (Guidance Section of the EAGGF) which represents less than 5 percent of the global expenditure in the agricultural sector. In section 4 some evidence is shown of the minimal impact that can be forecasted for the set-aside regulation.

Nevertheless it should be underscored that these measures can not be judged only by themselves, but in the perspective of the changes in the Common structural policy. In the 1970s the main objective of the structural policy was to increase efficiency of the farm through investments aimed at raising productivity. Inevitably this approach has boosted production, amplifying the effects of price policies. In the 1980s the attitude towards structural problems has changed dramatically. At present, the major concern seems to be the consistency between structural policy and the needs of CAP reform. The emphasis is placed more on supply control than on farm efficiency and this is apparent in the case of regulations like set-aside, which distorts the relative prices of the productive factors (Boussard, 1988). With this premise it can be argued that the relevance of the new regulations is amplified by the fact that they replace old regulations at variance with them.

C. Co-responsibility levies

Co-responsibility levies are the simplest way to take into account budget problems. Even if the fixing of high support prices together with the imposing of levies may seem contradictory in economic terms, it is well-know that farmers seem to prefer this kind of policy mix to a reduction in support prices. As a matter of fact "basic levies", equal to 3 percent for cereals and to 2 percent for sugar, can also be considered as instruments for increasing the financial resources of the Community and make it possible to face the swift escalation of agricultural expenditures.

However, levies can also be used as flexible signals for farmers to reduce production. In this case the amount of the levy should be related to the imbalance between supply and demand, as in the of the sugar regime where the amount of the "additional levy" is strictly related to the budget expense. The same could be said for the cereals regime, with a "super levy" that is partially proportional to the production overflow from the fixed threshold. In this perspective the co-responsibility levies represent an integral component of the recent strategy of the Commission designed to stabilize the agricultural budget expenditures.

D. Stabilizers

After the decisions of 1988 the "stabilizer" approach should be considered the general strategy of the EC as the Commission claims to have introduced this scheme for every product. Actually the official definition, which includes all the automatic mechanisms related to the overflow from a threshold, seems to be too broad in as far as it includes also quotas and co-responsibility levies. Instead, it seems more useful to draw a distinction between different policies, highlighting the peculiar features of the stabilizer mechanism.

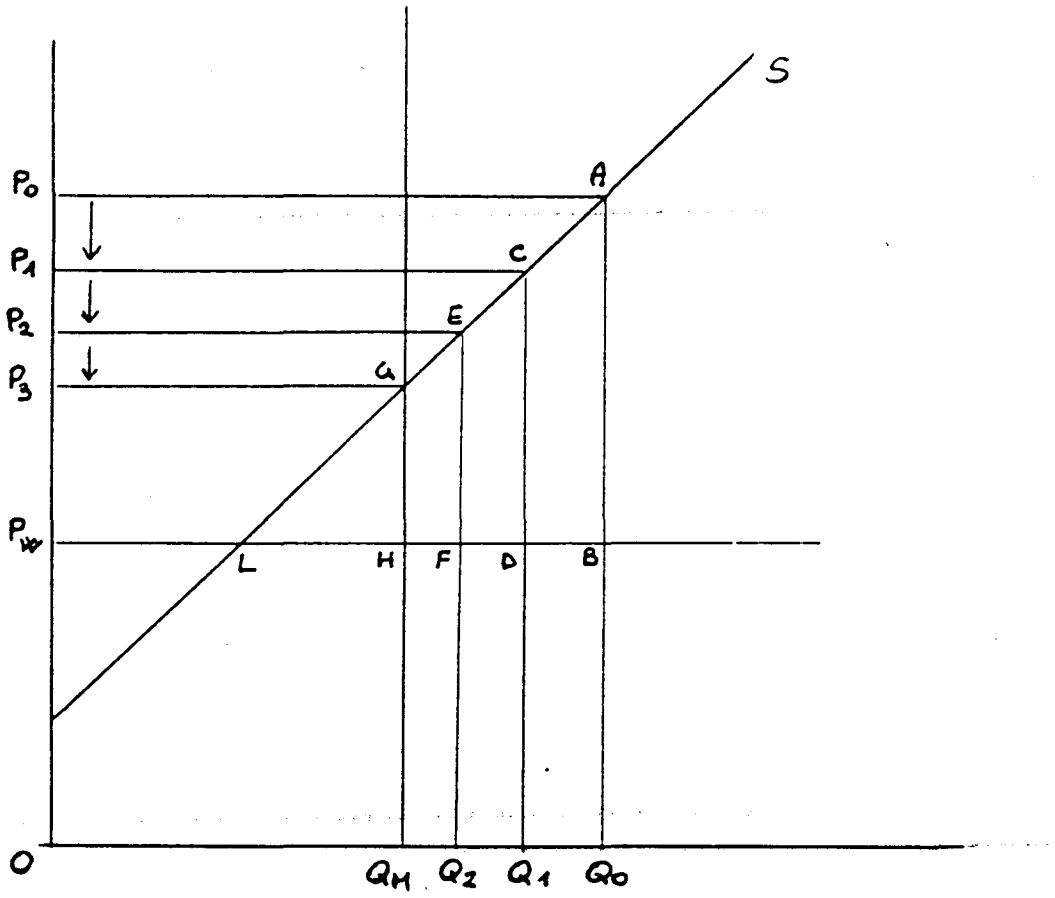
First, the budgetary context should be considered, given that the increase in the EAGGF expenditure is fixed. As a consequence financial guidelines are fixed for each product and the intervention price depends on the output as long as an established threshold is exceeded. The crucial point is that the price reduction impinges on the whole output, whereas in the case of quotas or two-price systems only the production above the threshold is involved. Finally it is important to underscore that the stabilizers are implemented on a multi-year basis (usually 3 years) in order to reduce the uncertainty of farmers (and of budget expenditure).

The stabilizer system has been implemented according to two different schemes. In the first one - adopted for products like cereals, fruit and vegetables - support is reduced by a fixed amount in the following marketing year, as long as the guarantee threshold is exceeded. For example, in the case of cereals the exceeding of the threshold implies a price reduction of 3 percent in the following year, while a co-responsibility levy up to 3 percent is charged in the same year proportionally to the overshooting in production. The crucial feature of this scheme is that penalty price reductions are cumulative, in the sense that they are carried over from one year to another. This is shown in figure 1, where Q_M is the guarantee threshold and P_o is the intervention price. Since the output (Q_0) corresponding to this price exceeds the threshold, in the the following year the price will be P_1 and further reductions of the same percentage could take place in the following years as long as there is an overshooting in production. Obviously this process could converge on the world price, provided that the threshold is fixed equal to the free-trade output or that we allow a downward shift of the supply curve induced by technical progress[8] As far as the second scheme - adopted for products like oilseeds and tobacco - is concerned the overshooting of the guarantee threshold implies a reduction in producer price that is proportional and takes place in the same year, but is not cumulative: this means that the following market year will start again with the previous level of support. In the case of oilseeds, for example, the exceeding of the threshold implies a reduction in the aid according to a coefficient of 0.5.[9] This is shown in figure 2, where the producer price is P, but if the quantity OQ_M is exceeded, there is a price reduction according to the line CF that is drawn on the basis of the reduction

8. In the "large country case" this process would be even more evident. As a matter of fact, the supply reduction within the country would imply an upward move in the world price line (Pw) and this corresponds to an increase in the free-trade output (point L would shift to the right along the supply curve).

9. That is a 0.5 percentage point reduction in the producer price for each percentage point of overshooting in production.

Figure 1: STABILIZERS (cereals)



coefficient. Since there is not a cumulative process of price reduction as in the previous case, in each year the starting producer price is maintained at P (at least during the multi-year program).

In conclusion we can point out that the latter scheme seems more effective in stabilizing the budget expenditure year by year. On the other hand the first scheme seems more suitable in the long run as it allows a gradual reduction of the gap between domestic and international prices, provided that the guarantee threshold is fixed appropriately.

As far as the European Community is concerned, it should be emphasized that supply control and expenditure control policies are strictly interlinked. In the EC perspective both share the same goals, that is to curb production and to reduce budget costs, but it is important to point out that supply policies have a direct effect on saturated markets while in the case of expenditure policies the quantitative reduction of production is an indirect and uncertain result. Consequently, from the international point of view the first class of instruments seems more effective at least in the short run: for example, if the demand for imports were to increase, a quota would hold the domestic production constant and permit the full increase in demand to be imported, while the same would not be necessarily true with expenditure control policies. On the other hand it will be seen in the next section that the PSE is more sensitive to the effects of the financial stabilizers than to the effects of quotas: this could be particularly relevant given that expenditure control policies in the current CAP framework seems bound to play a greater role in the near future.

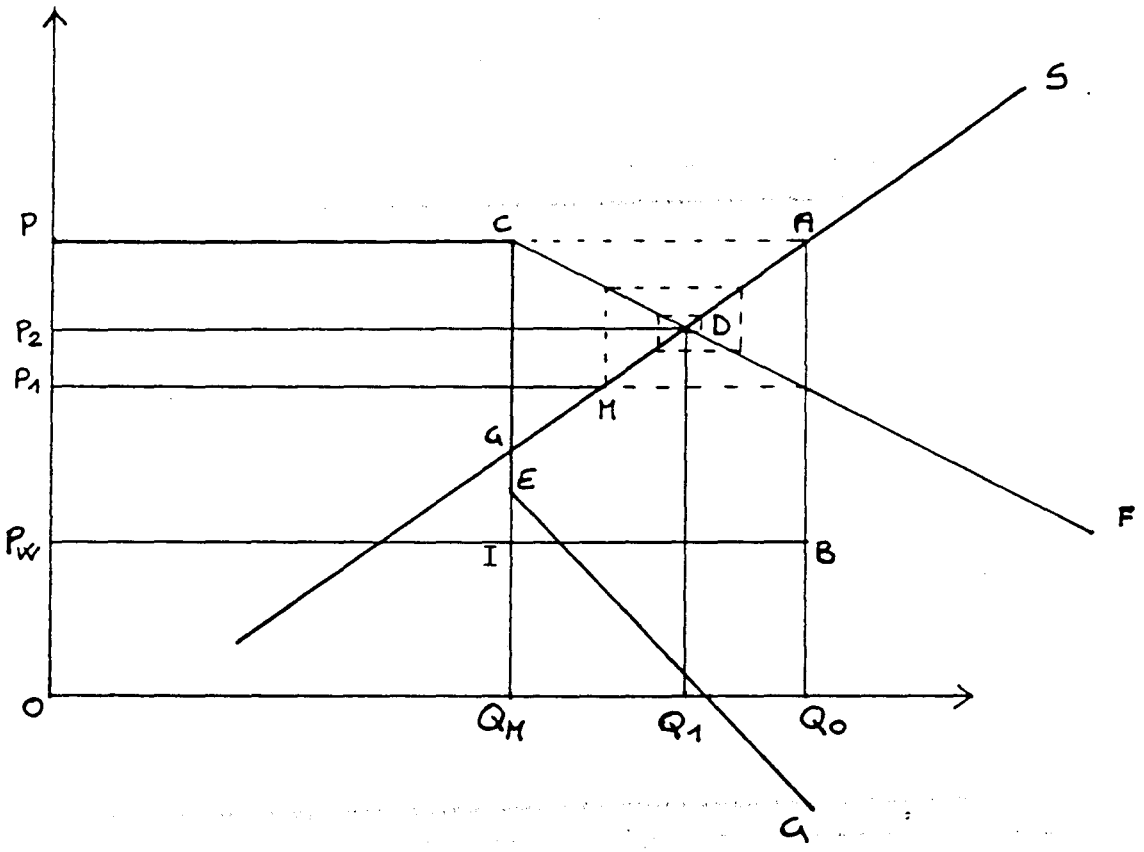
3. Bringing Control Measures Under PSE

This section concentrates on the problems which arise dealing with the supply-expenditure control measures in an AMS framework. In particular, the emphasis is placed on the sensitivity of the PSE with respect to the effects of these measures in terms of reduction in trade distortions induced by agricultural support as well as the possibility and opportunity of giving some "credits" to the country (EC in our example) that is adopting them.

In this context there are two main features that are crucial:

i) the capability of the PSE to capture the <u>effect of the initial adoption</u> of a supply-expenditure control measure in the EC price support system;

Figure 2: STABILIZERS (oilseeds)



ii) the sensitivity of the PSE with regard to the yearly implementation of these measures, once they have been put into operation.

The following discussion is based on the standard demand-supply partial equilibrium analytical framework. For the sake of simplicity our graphical representation relies upon the small country assumption, but in the comment we will try to take into account some implications of the large country case.

A. Production quotas

In figure 3, Pw is the world price and P the EC intervention price. In the absence of supply control measures, production is $0Q_1$, consumption $0Q_2$ and export AB, with a total amount of export restitutions equal to ABFC. In the absence of other measures the percent PSE is:

$$\%PSE = \frac{0Q_1(P-Pw)}{0Q_1.P} = \frac{P-Pw}{P}$$

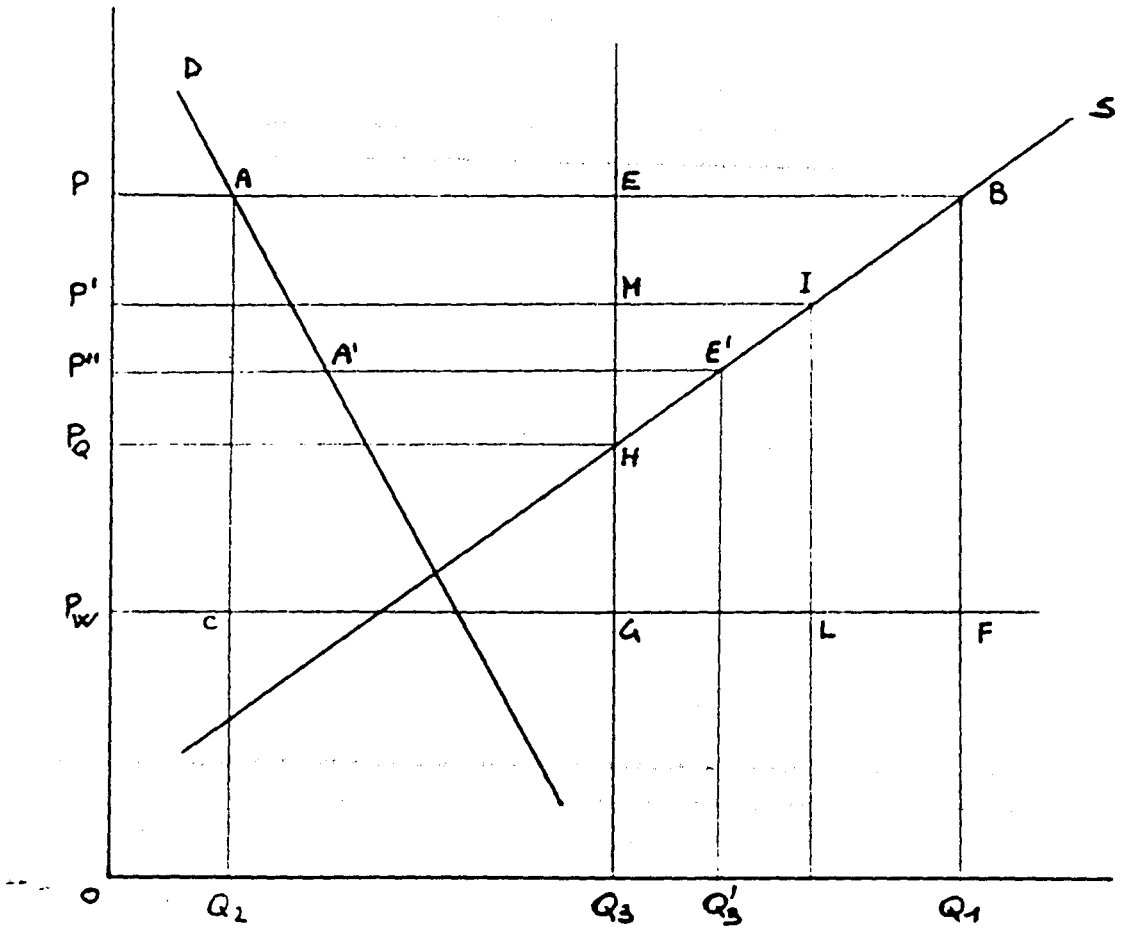
If a production quota $0Q_3$ is imposed, the subsidized export falls to AE, the EC expenditure is reduced to AEGC, but the percent PSE remains unchanged:

$$\%PSE = \frac{0Q^3(P-Pw)}{0Q_3P} = \frac{P-Pw}{P}$$

The percent PSE could decrease in the large country case, in proportion of the increase in Pw resulting from the reduction in export induced by the production quota. But this is only an indirect (and probably in many cases not substantial) effect, which could be considered an inadequate recognition of the supply control actions in terms of reduction of the AMS.

This shortcoming could be circumvented using the total PSE (PSET) instead of the percent PSE, that is the numerator of the ratio (McClatchy, 1987). In fact PSET is perfectly sensitive both to the reduction in Q induced by the quota and (in the large country case) to the increase in Pw induced by the reduction in export. A problem which arises with PSET is that, while it could be considered a suitable indicator for monitoring a given reduction of the support, it is not appropriate for comparing the

Figure 3: Production Quota



starting points of various countries[10] For this purpose the percent PSE performs better, so the problem becomes how to incorporate in its calculation some "credit" for countries imposing production quotas.

As a general rule, a credit could be given deriving the "price reduction equivalent" of the quota: at first glance, the shadow price of the quota could be considered P_Q in figure 3, that is the price corresponding to an output equal to the quota (Q_3) along the domestic supply curve. But, in the AMS approach, what we need is a shadow price equivalent to the quota in terms of support rather than in terms of output. This means that we have to find that price which, in the absence of any quota, would imply a reduction in PSET equal to that under the quota regime. With reference to figure 3, since the reduction in PSET induced by the quota is the area EBFG, the corresponding shadow intervention price would be P', providing that the area PBIP' plus IBFL is equal to the area EBFG. The use of P' would ensure a reduction of the "quota total-support-compensated PSE" ($PSEQ_1$), which becomes

$$PSEQ_1 = \frac{P'-Pw}{P'} < PSE = \frac{P-Pw}{P}$$

In a different approach, one could focus the attention on the effect of quotas in reducing trade distortion rather than the total amount of support.[11] In this case the shadow intervention price should be the price that, in the absence of any quota, would imply an amount of subsidized export (A'E') equal to that (AE) coming out as result of the quota regime. In figure 3 this price would be P"; since it is lower than P', the "credit" in terms of reduction of the "quota trade-distortion-compensated PSE" ($PSEQ_2$) would be greater:

$$PSEQ_2 = \frac{P"-Pw}{P"} < PSEQ_1 < PSE$$

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10. One advantage of the AMS approach is the possibility of negotiating a reduction in agricultural support based on some "formula." Obviously in such an approach an indicator of the starting level of support is important to determine the burden of the adjustment for each country.

11. This approach is consistent with the early theoretical rationale of trade distortion equivalent rather than PSE (McClatchy, May 1987).

In the large country case, the decrease of the "quota compensated PSE's" would be reinforced by the increase in Pw that is due to the reduction in export ensured by the production quota. Obviously, this further decrease of the $PSEQ_s$ would be analogous to the already mentioned "indirect" decrease in the uncompensated percent PSE.

What has been said up to now is related to the problem of capturing by an AMS the effect of the initial adoption of a quota system: the use of an indicator of total amount of support (PSET in our example) or the derivation of a "price reduction equivalent" could be workable solutions. However, when a production quota is already in operation, the problem of capturing by an AMS the effects of its yearly implementation is less straightforward. First of all, it is impossible to derive a price reduction equivalent because the unrestricted supply curve (along which we should move to find it) does not exist any more. Furthermore, an indicator of total amount of support such as the PSET is an unreliable instrument in this context: for example, a reduction in the production quota, that is a reduction in exportable surplus or an increase in demand for imports towards the free trade levels of these variables, implies a reduction in trade distortion; but if it is associated with an increase in the domestic producer price the change of the PSET will not be proportional to this improvement: in the extreme case, in which the increase in producer price were more than proportional to the decrease in production, the PSET would even increase.

More generally, when compulsory supply control measures like quotas are in operation, it does not make much sense to use an AMS like the PSE based on price differentials: in fact, as far as trade distortion is concerned, supply control should be considered as the crucial variable and hierarchically superior to any domestic price maneuver. Probably in this context the problem of "credits" or "debits" to be given to the implementation of a quota system is just a matter of negotiation, which addresses directly the physical quantities exported or imported.

B. Set-aside

As we said in the first section of this paper, EC structural policy is shifting the focus of its effort from economic efficiency to supply control. In the last two years this action has taken the form of optional

measures (incentives), oriented to the reduction in the use in agriculture of factors like land (set-aside), labor (pre-retirement), fertilizers and pesticides (extensification). The effects of these measures are very similar. In figure 4 the case of set-aside is illustrated. The starting point is a world price Pw, a national producer price P, a production OQ_o. In the absence of other measures of support the PSE's are:

$$PSET = (P-Pw).Q_o = PABPw$$

$$\%PSE = \frac{(P-Pw).Q_o}{PQ_o} = \frac{P-Pw}{P}$$

When set-aside is in operation, its effect is an inward shift of the supply curve from So to S_1 and a budget expenditure at least equal to the area ADF.[12] The production falls from Q_o to Q_1 and subsidized export from EA to ED, with a saving in Community expenditure for export refunds, equal to the area ABCD. The PSE_s are:

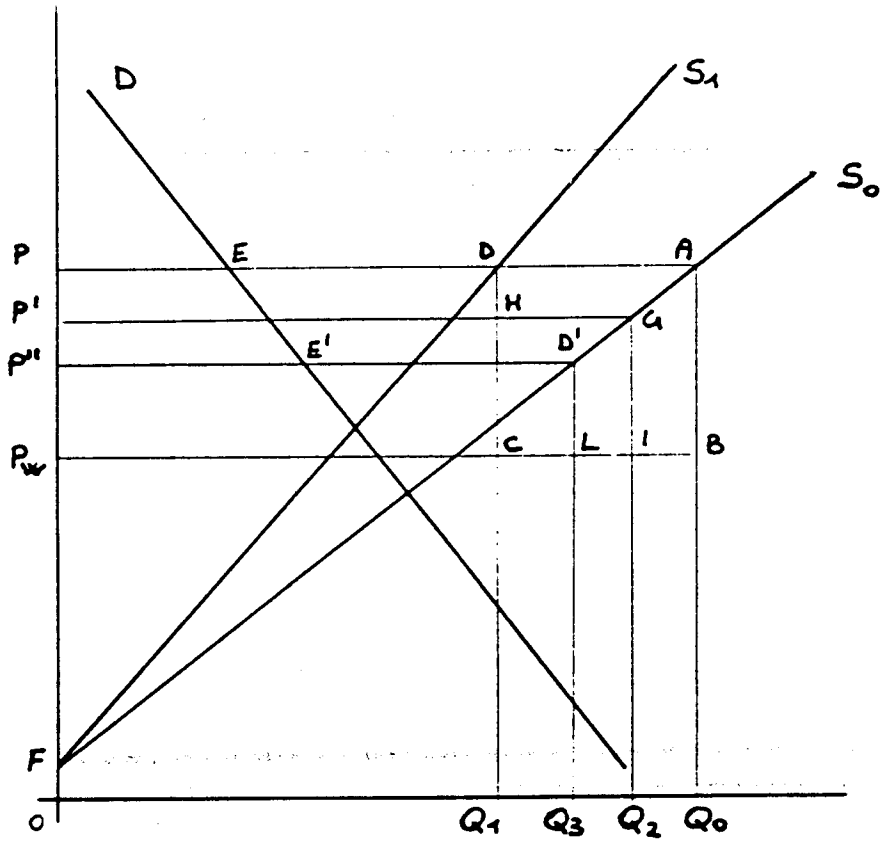
$$PSET = (P-Pw).Q_1 + "B" = PDCPw + "B"$$

$$\%PSE = \frac{(P-Pw).Q_1 + "B"}{PQ_1} = \frac{P-Pw}{P} + \frac{"B"}{PQ_1}$$

Where "B" is the total amount of set-aside compensation payments given to farmers. This means that the uncompensated percent PSE surely increases, while PSET increases or decreases depending on the magnitude of "B", that has to be added to the PSET, in comparison with the area ABCD, which disappears as a consequence of set-aside. Since this area represents the induced saving in export restitutions, we can conclude that PSET will decrease as a consequence of set-aside only so far as this policy will

12. This is the producer surplus that is lost as a consequence of the shift of supply curve induced by set-aside. An obvious assumption is that the compensation payments from the budget have to be at least equal to the profit lost by producers who are sharing the set-aside program.

Figure 4: Set-aside



prove itself to be efficient in reducing expenditure.[13] These responses of the PSE to a policy designed to curb production are not helpful, since they don't give recognition to an action that should be considered desirable as far as trade distortions are concerned. Consequently, a problem arises of giving some "credit."

The most obvious "credit" to be given to set-aside would be to consider it a fully decoupled policy and then to forget "B" in the calculation of PSE_s. This is consistent with the EC approach to AMS, since the indicator proposed by the Community (SMU) does not take into account the (structural) measures, decoupled from quantity produced. In this way the PSET decreases, but percent PSE still remains unchanged. As in the case of a quota, the issue of giving credit for set-aside in terms of percent PSE reduction, could be faced by deriving its price reduction equivalent.[14] In our example, P' is the shadow intervention price corresponding, in the absence of set-aside, to a reduction in PSET equal to that induced by set-aside, omitting the "B" component (the area P'GlPw is equal to the area PDCPw). Conversely, in a TDE rationale, P" is the shadow intervention price which, in the absence of set-aside, would imply an amount of subsidized exports (E'D) equal to that (ED) resulting from set-aside. Obviously, by using P' or P" instead of P, the value of percent PSE falls:

$$\frac{P-Pw}{P} > \frac{P'-Pw}{P'} > \frac{P''-Pw}{P''}$$

Also in the case of set-aside, for a large country, PSE reduction could be reinforced by the increase in Pw induced by the related reduction of export or increase of import.

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13. In a recent paper Koester (Koester 1989) shows that in the EC context it might be very difficult to obtain this outcome.

14. Also in this case the derivation of a shadow intervention price presupposes the estimation of the "unrestricted" supply curve. But differently from the quota case, since the amount of set-aside land is known, this estimation should be possible. This means that in theory also the yearly implementation of set-aside could be taken into account by this approach.

C. Stabilizers

In the first section it has been pointed out that the implementation of financial stabilizers can be considered as the major feature of the current EC approach to CAP reform. In this sense it is important to test the performance of PSE_s in capturing the effects of the stabilizer mechanisms.

Let us start with the oilseed-type regime, that is to say a proportional and non-cumulative producer price penalty which is applied in the same year in which the Maximum Guaranteed Quantity (MGQ) is overshot. In figure 2, Pw is the world price, P the domestic producer price and S the supply curve. In the absence of a stabilizer and of any other control measure, production would be $0Q_o$ with a PSET amounting to the area PABPw and a percent PSE equal to (P-Pw)/P. If a stabilizer is put into operation with a MGQ fixed at Q_m, there are three main possible outcomes.

i) If farmers have access to perfect information both on policies and on other farmers' responses and if they behave rationally on a collective basis, the whole agricultural sector can be considered as a single monopolistic firm, facing a kinked marginal revenue curve like PCEG in figure 2.[15] In such a context the output response depends on the magnitude of the MGQ and on the supply elasticity. If the elasticity is high and/or the MGQ is small, the supply curve will cross the marginal revenue curve on the right of point E, and the output which maximizes the aggregate producer surplus will exceed the

15. This is not just a theoretical case: for example it could apply to the production of soya in Italy, where all the producer are strictly controlled by a single food processor (i.e. Ferruzzi).

MGQ.[16] More probably, as it is shown in figure 2, the intersection will take place between points C and E, with an optimal output equal to the MGQ. In this case, a collusive agreement should provide a compensation from more efficient farmers in favour of those who are giving up production. As far as PSEs are concerned, we are back to the quota case, with a PSET that decreases from PABPw to PCIPw and a percent PSE that remains unchanged.

ii) At the other extreme, with bad information and absence of mutual commitment, farmers will continue to respond to price P: the production remains unchanged at Q_o, but the producer price falls to P_1.

iii) An intermediate and probably more realistic scenario is the presence of good information and the lack of collusive behaviour; in this case farms will produce a quantity ranging from Q_M to Q_o, receiving a price ranging from P_1 to P. In the figure point D is indicated, which corresponds to a situation of perfect information.

In the last two cases both PSET and percent PSE will decrease, but they perform well in capturing the reduction in trade distortion only in the iii) situation: in this case, with price at P_2 and production at Q_1, lower values of PSET and percent PSE reflect a real reduction in production and (consequently) in trade distortion, while in the

16. It is important to point out that the MGQ is an indicative production target for the EC as a whole and not for each farmer: in the case of overshooting farmers who did expand production receive as much for each tonne produced as those who did not expand or even reduced production. This implies a contradiction between collective and individual rationality, that is the classic issue concerning free riding.

ii) case, with the production remaining at Q_o, they reflect only the penalty reduction of the producer price. These problems are connected to the first adoption of the stabilizer, but they partially disappear in the following years, when also in the simplest case of adaptive expectations, only based on the price received in the previous year, the market equilibrium is probably bound to converge towards the point D.[17]

The cereal-type regime (figure 1) seems to be less complex as, in the case of overshooting, the price penalty takes place in the following year and the reduced price is carried over from one year to another.[18] Provided that the farmers' strategy is not collusive and is not based on a multi-year maximization of the global producer surplus, the final result will be a production OQ_M (that is equal to MGQ) with a price reduced to P_3. As far as the PSE is concerned, both PSET and percent PSE will decrease, reflecting the reduction in trade distortions, even if with a lag of one year.

4. The Set-Aside Regulation

The set-aside regulation, issued in 1988, commits the participating farmers to a reduction of at least 20 percent of their land for three years or more. The Commission forecasted that about one million hectares would have been involved, that is less than 3 percent of the EC arable land, with

17. This happens provided that the supply curve is sufficiently inelastic and/or the MGQ is small enough to leave point M on its right.

18. For the sake of simplicity we do not consider here the coresponsibility levy that is charged (up to 3%) in the same year proportionally to the overshooting.

a budget cost of 140 millions ECU, which corresponds to less than 1 percent of the agricultural expenditures.

Table 1 shows the data referring to the 1988-89 agricultural season, that is, the first year of implementation of the program. Even though in Denmark and Luxemburg the scheme was not yet applied, 440,456 hectares have been set aside. The highest number of applications occurred in the Federal Republic of Germany and in Italy, while France, which is the most important agricultural producer, has a share of only 3 percent of the total land set aside (the French share in the Community arable land amounts to 25 percent). Moreover, we can see that the proportion of the area set-aside as a percentage of arable land is extremely low (0.92%) and the same holds for the area in cereals (1.33%), which can be considered the main objective of this policy.

In order to carry out a deeper analysis it would be necessary to have more information about the yields in the area set aside. As far as Italy is concerned only 16 percent of the area set aside is located on the plain. If this proportion were confirmed in the other Member States, as it seems reasonable, the impact of the scheme on the global output will be really negligible. Just in order to have an idea of the impact we can assume that all the land set aside is from cereals and that the average yield on this land is equal to the Community average. According to these assumptions there is a clear overestimation, but even in this case the supply reduction amounts to about 2 millions of tons, that is less than 1.7 percent of the output in 1987 (E.C. Commission, 1989).

Finally, it is possible to work out a tentative estimate of the PSE reduction implied by the previous output reduction (2 millions tons of cereals). Given that we use PSE estimates published by the USDA for 1986, there is no need to take into account budget expenditure related to set-aside implementation. We simply calculate the average difference between internal and world prices of cereals, then we multiply this figure ($76/ton) by the forecasted reduction. The final outcome, about $170 million, corresponds to less than 2 percent of the total PSE of cereals (more than $9000 million) for that year. Since our figures most probably overestimate the effective impact of the policy, we can conclude that set-aside is, at this moment, of little relevance in controlling EC oversupply.

TABLE 1

Area of lands set aside, number of holdings participating and use of land, by Member State

Member State	Number of applications	in hectares	Area to be set-aside of which %						Proportion of the area set-aside as a percentage of		Average area set aside per applicant (in hectares)
			rotational fallow	permanent fallow	afforest-ation	extensive grazing	Non agri use	Chick peas, etc.	arable land	area in cereals	
FRG	25,289	169,729	47.3	52.8	0.5	1.1	0.3	-	2.4	3.6	6.70
IT	9,806	160,089	25.06	44.5	3.47	24.02	0.76	2.17	1.87	3.17	16.73
UK	1,750	54,779	11.01	79.67	1.44	-	7.74	-	0.93	1.37	31.3
SP	518	34,229	29	41.3	4.1	5.1	0.9	19.8	0.35	0.45	66.1
FR	1,002	15,707	28.93	62.6	4.97	-	3.6	-	-	0.16	15.68
IRL	77	1,310	2.53	23.49	3.16	64.57	6.25	-	0.13	0.37	17.01
NL	195	2,621	63.49	31.72	4.04	-	0.47	-	0.29	1.32	13.44
GR	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BE	32	329	18.1	42.45	10.1	7.4	21.6	-	-	-	10.28
TOTAL	39,235	442,456	32.45	51.96	2.12	9.47	1.59	2.33	0.92	1.33	11.31

SOURCE: Information communicated by Member States, 16 June 1989. The scheme was not applied in Denmark or Luxemburg in the 1988-89 agricultural season. Portugal is exempt.

NA = Not available

5. Concluding Remarks

Curbing production and keeping budget expenditure below a fixed ceiling are the main objectives of the CAP reform. Obviously, supply control measures and financial stabilizers are strictly interlinked from an EC point of view, but their implications could be very different on the international arena. In particular, supply policies like quotas have a direct effect on saturated markets and, consequently, could be very effective in reducing or controlling trade distortions. Conversely, in the case of financial measures like stabilizers, the production (and trade) effect is an indirect and uncertain result. On the other hand, as far as the monitoring of these effects is concerned, it has been shown that the PSE is almost fully sensitive to the effect of financial stabilizers; on the contrary as a price-based indicator, the PSE is partially inconsistent with physical and compulsory supply control measures like quotas. In particular with respect to the PSE's capability of monitoring the effect of single measures, our graphical analysis has highlighted the following points:[19]

i) Quotas: the percent PSE is not sensitive at all; a credit could be given in terms of price reduction equivalent (shadow prices), but only for the first adoption of a quota, when an unrestricted supply curve exists. The total PSE (PSET) is fully sensitive, provided that the gap between domestic and world price does not increase within the quota.

ii) Optional measures (e.g. set-aside): percent PSE is sensitive in a "wrong" way: in fact it captures the increase in domestic support but not the hoped effect in production. In order to keep the percent PSE constant, an obvious "credit" is to dismiss the budget expenditure ("B" component) from its calculation. A further credit which would allow a reduction in the percent PSE, could be the use of a (lower) shadow intervention price. The estimation of such a price would certainly be less difficult than in the quota case. With reference

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19. It should be underscored that the following results are based on the small country assumption or, equivalently, on the assumption of a fixed world reference price in PSEs' calculation. It can be remarked that a fixed reference price is included in the SMU indicator proposed by EC.

to the PSET, it is fully sensitive, as long as the "B" component is not taken into account.

iii) Stabilizers: both the percent PSE and the PSET are sensitive in a wide spectrum of assumptions on the farmers behaviour.

The message of our analysis, in an AMS framework and from an EC point of view, could be summarized in the following proposals:

i) to maintain the existing quotas for milk and sugar as a heritage of the past; and to directly address the negotiations about these sectors to the physical quantities exported or imported;

ii) to strongly implement the stabilizer mechanisms that are perfectly consistent with the AMS approach: in this perspective a commitment to the AMS's reduction would be added to the present budget worries in fixing thresholds and penalty prices;

iii) to allow credits for optional supply control policies: an obvious credit should be the elimination from the AMS of the budget payments related to such policies; further credit mechanisms could be envisaged, even if the impact of these measures has been negligible up to the present time.

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POLITICAL ECONOMY OF POLICY REFORM IN THE UNITED STATES AND THE EUROPEAN COMMUNITY

Martin Johnson, Louis Mahe and Terry Roe

Summary of Results

INTRODUCTION

Purpose

Partial liberalization of agricultural policies is known to generate economic benefits worldwide. Still, negotiations of agricultural policy reforms in the GATT are difficult because policy reform impacts real incomes of special interest groups. This research provides insights into the various economic tradeoffs between policy choices that might be pursued by the United States and the European Community. The approach is distinguished from others by explicitly considering the linkages between economic and political gains and losses.

The Economic Model

The economic analysis is based on a partial equilibrium, world trade model of the production and consumption of cereals, soybean meal and other vegetable proteins, livestock feed substitutes, beef, pork and poultry, dairy, and sugar. This model "Model International Simplifie de Simulation" (MISS) was developed by Guyomard, Mahe and Trochet. For the majority of the results summarized below, the model treats the European Economic Community, the United States and the rest of the world as separate production, consumption and trading regions; the results from another version that treats the rest of the OECD as a separate region are also reported.

The economic model estimates the applied welfare gains (producer, consumer surplus) for the mentioned products, consumers and budgetary expenditures. These values are inputs into the measurement of political gains and losses from economic policy.

The Political Economy Model

The political gains and losses from policy reforms are based on the theory of public choice. The two postulates of importance to the results reported here are that (a) political authority forms preference over the welfare of individual producer and consumer groups that correspond to the above commodity categories, and to the rest of society as reflected in the budget effects of economic policy, and (b) political preference can be revealed from past policy.

Using these postulates, "political preference weights" are estimated for each of the mentioned applied welfare measures. The general procedure for estimating these weights appears in the appendix.

Game theory is used to combine the economic model with the theory of public choice. This permits the drawing of the inferences as to what the U.S. (EC) best strategy might be given that the EC (U.S.) pursues a particular policy option. Our estimates of the value obtained and some of the key qualifications that need to be placed on these values are discussed next.

ESTIMATION OF POLITICAL PREFERENCE WEIGHTS

Political assessments of policies can differ from economic assessments of policy because, for the same economic gains or losses, some groups have more political influence than others. This is due to the nature of their lobbying process and other political factors not taken into account in economic analysis. Measures of the political importance of the income gains or losses to various commodity groups, consumers, and the rest of society, as reflected by budget gains or losses are shown in Table 1. These measures can be interpreted as political weights per dollar of income gained or lost. An important assumption affecting the magnitude of these estimates is that the political influence of the various groups impacting on agricultural policy is revealed in the policy choices embedded in the 1986 farm programs.

Changes in the world economy since the formulation of the 1986 vintage policies have most probably increased the relative weight of the budget in

agricultural policy formulation in both the United States and the European Community. It is also likely, given the special circumstances in 1986 of historically high budget support for agriculture in both the United States and the EC, that the revealed policy weights of the budget, based on the 1986 outcome, understate its true policy weight. Thus, the difficulty discussed below of finding an acceptable mutually beneficial solution between the United States and the European Community may be over estimated. Nevertheless, it is unlikely that the rankings of political weights between the different interest groups has changed appreciably since 1986.

POLICY SIMULATIONS

This section reports on simulations performed using the estimated policy-goal functions and the economic framework of the MISS model to obtain insights into the possible treaty framework involving tariffication, recommended by the US, and symmetrical liberalization as measured by PSE, recommended by the EC.

Simulations Focusing on U.S. and E.C. Liberalization Scenarios

General insights into the interaction between US and EC policy choices are provided in Table 2. Three policy options were simulated for both the US and the EC: the status quo (sq) of 1986; partial free trade (pft), meaning free trade in cereals, oilseed cakes, protein feeds, beef, pork and poultry with no change in sugar and dairy programs; and free trade (ft) in all seven commodity groups.

The options for the EC are: the status quo (sq) of 1986; tariffication of all agricultural programs except dairy and sugar with a tariff maximum of 20 percent (t20%); and free trade (ft) in all seven commodities. Nine simulations are reported. Each simulation contains two numbers (V_{us},V_{ec}) which result when the U.S. chooses a policy corresponding to a row and the EC chooses a policy corresponding to a column. To depict gains and losses from the status quo, V_{us} and V_{ec} are normalized at zero for the status quo of 1986, the base period of the MISS model. Table 2 is consistent with the mentioned hypothesis of the political economy model: given that the EC plays column (sq) the US should (and did) choose row (sq). The US receives 0 as opposed to -653 or -2074.

Table 1. Revealed Political Weights per Unit Value of Income Gained or Lost to Different Interest Groups in the United States and the European Community, Based on 1986 Parameters and Data

	United States		European Community	
Crops	Rank	Magnitude $(w_{us,j})$*	Rank	Magnitude $(w_{ec,j})$*
Sugar	1	1.56	1	1.57
Dairy	2	1.29	2	1.46
Animal Feeds	2	1.23	4	1.32
Grains	4	1.15	3	1.34
Budget	5	1.00	5	1.00
Beef	6	.92	4	1.32
Consumers	7	.87	6	.83
Pork & Poultry	8	.85	7	.95

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* j = sugar, dairy, animal feeds, grains, budget, beef, consumers, pork & poultry. The implied "welfare function is:

$V_i = \Sigma_j w_{ij} p_{ij}, 1 = U.S., E.C.$, where $w_{i,Budget}$ equals unity.

Table 2. Policy Goal Function Values For Alternative Policies Pursued by The MISS Model.

		E.C. Policy	
U.S. Policy	Status Quo (sq)	Partial Free Trade (t20%)	Free Trade (ft)
Status Quo (sq)	0,0	636,-2385	697,-5147
Partial Free Trade (pft)	-653,299	182,-1806	540,-4997
Free Trade (ft)	-2074,1020	-1329,-656	-876,-4408

* The values denote the tuple (V_{us}, V_{ec}).

Similarly, if the US plays row (sq), the EC should (and did) choose column (sq), receiving 0 as opposed to -2385 or -5407. Consequently, given the values reported in Table 1, these results show that both the US and the EC have an interest in the other liberalizing its agricultural policies but little interest in liberalizing its own policies.

How do these results correspond to the US and EC treaty proposals at Geneva? The American proposal called for free trade in all agricultural products, but with the option of providing decoupled payments to producers. Notice (ft,ft) leads to a negative V_{us}, a compromise worse than the status quo. Decoupled payments are necessary to pay off those who lose from free trade and ensure a better compromise. The European proposal emphasized short term measures to ameliorate immediate surpluses. Despite the American drought of 1987 which mitigated these problems, the EC negotiating position still focuses on moderate measures. Table 2 is a good indication why.

The liberalizing options reported in Table 2 not only simulate the abandonment of the center piece instruments of the CAP, variable levies and restitutions, but they also imply large reductions in agricultural supports. The resulting loss in welfare to producer groups, given the estimated weights $w_{ec,j}$, dominates any budgetary savings or increases in consumer welfare. Hence V_{ec} is negative for both liberalization options.

Not reported in Table 2 are the results from simulating a more "moderate" agreement where the EC cuts grain support prices by 10 percent, oilcake prices to producers by 10 percent, and pork and poultry supports by 3 percent. In exchange, the US is assumed to install a dairy quota to cut production by 20 percent and allow the EC to levy a tariff on oilcakes and protein feeds of 20 percent. This set of policies increased V_{us} to 198 and V_{ec} to 338. Thus, under this "moderate" agreement, both the US and the EC are better off than under the status quo.

Two political economic conditions motivate the result of this moderate proposal and the results of tariffication in Table 2. First, tariffs are imprecise instruments. Adjusting a tariff affects both producer and consumer prices. Without export subsidies or restitutions, producer income is limited not only by producer prices but also by domestic demand.

Allowing governments to differentiate between producer and consumer prices effects a more efficient transfer of income from the agricultural budget and consumers to producers.

Second, in the EC the tariffication of oilseed cake policies requires a drastic cut in support prices. Even modest cuts in grain price supports entail large drops in grain producer welfare hence in V_{ec}. For example, if the US chooses (pft) and the EC drops the domestic grain support price by 10 percent from the status quo, V_{ec} drops from 299 (Table 2) to -514 (Table 3). In the case of the moderate proposal, this loss was compensated through the tariffs on oilseed cakes. These simulations and those reported in Table 3 bolster the hypothesis that the EC has interests in only marginal liberalizations in trade.

Next, following the lead of table 2 to possible areas of mutual gains, we report on two additional set of simulations (Table 3).

All simulations in Table 3 were calculated with the US pursuing the partial free trade option (pft) of Table 2 and the EC leaves dairy and sugar policies unchanged. For the first three simulations, the EC pursues tariffication in beef and pork and poultry but leaves the tariff level at the status quo. It then decreases the tariff barrier on grains by the first number and levies a tariff on oilseed cakes and protein feeds equal to the second number. Domestic producer prices on cakes and feed are left unchanged. Restitutions are provided as needed.

The remaining entries are simulations where no restitutions are allowed and tariffication is introduced. Therefore the EC may be self-sufficient but can only export if domestic price equals world price. In contrast to the first three entries, the first number is the maximum tariff on beef. The second number is the maximum tariff on grains, cakes, and protein feeds.

Although the US may have an interest in drastic changes in agricultural policy, for example (pft, 20%) in Table 2 or pft and (30%, 20%) option of Table 3, the EC has interest in only marginal changes. Even the relatively mild liberalization (-20%,20%) of Table 3 results in a negative V_{ec}. Furthermore, mutually acceptable change, e.g., the mentioned moderate

proposal, requires a complicated use of policy instruments which make the identification of trade distortion and liberalization more difficult. If tariffication, no export subsidies, and no EC restitutions in all commodities are the final aim of the US negotiating position, then the model suggest the following.

Multilateral Negotiations Preferred to Bilateral

When the previous policy scenarios are performed with other OECD countries undergoing partial trade liberalization, the economic and political feasibility of the US-EC reaching an agreement was almost always increased. Mutually advantagous liberalization to both the US and the EC is enhanced if the rest of the OECD countries are also encourgaed to pursue liberalization.

Decoupled Instruments

Tariffication and the removal of export subsidies and export restitutions lead to large cuts in producer incomes. To achieve political acceptance in the US and the EC, to these changes can likely be enhanced with decoupled instruments.[20] To the extent that multilateral agreements increase producer incomes through trade in other agricultural products, or trade agricultural losses for non-agricultural gains, these payments can be less.

Benefits of Dynamic Factors

Taking technical change and increasing consumer incomes into account significantly improves both the economic gains and apparent political

20. In the context of this framework, lessening political acceptance amounts to payments to groups that contribute the largest negative values to the political goal function. These types of compensatory payments differ from the traditional Pareto compensation because those suffering economic losses from liberalization that do not contribute to large negative values of the goal function, i.e., they have little relative political power, would receive less and possibly no compensation. In this framework, budgetary savings from liberalization are sufficiently large so that compensation yields a zero value of the otherwise negative goal function. Hence, the gainers from liberalization, e.g., consumers, need not be taxed.

Table 3. Policy Goal Function Values: US Pursues Partial Free Trade Always, EC Leave Sugar and Dairy Policy Unchanged But Changes Other Policies

Relative to 1986, The E.C. Pursues
Tariffication in Beef, Pork & Poultry
(Tariff Level at Status Quo)

Decrease Tariff on Grains by*	Tariff Levied on Oilseed Cakes and Protein feeds	Political Goal U.S.	Function Values E.C.
-10%	20%	-727	556
-15%	20%	-636	236
-20%	20%	-514	-207
Tariffication With No Restitutions Allowed	**Maximum Tariff on Grains, Cakes, Protein Feeds**		
50%	30%	-104	-1075
50%	25%	- 87	-1080
30%	20%	17	-1475

* Effectively, the E.C. decreases domestic price levels by 10, 15 and 20 percent respectively and sets variable levies to support these prices.

acceptability of the trade liberalization scenarios studied. Technical progress tends to lower production costs thus maintaining farm income in the face of partial trade liberalization. Budget expenditures increase in the presence of technical change and no trade liberalization. Thus over a 5 and 10 year period, liberalization with technical change yields large budget savings without income loss to farmers. Hence, liberalization becomes more economic and generates less adverse political pressure in this dynamic context relative to a comparative static stationary environment.

CONCLUSION

The focus of this analysis is the search for trade liberalization positions that are politically acceptable to the US and EC. To find these positions, this report has offered a framework which is based on the assumption that the preferred trade liberalization policy is one which arrives at political outcome that is preferred to the status quo outcome of the base period, 1986. Given estimates of political preference weights, the preliminary results seem to substantiate and explain the basic negotiating positions of the US and the EC. There are two main conclusions: mutually advantageous agreements only exist in marginal changes in present agricultural policies, and larger changes will require the multilateral negotiating framework of the GATT or the linkage of liberalizations of interest to the EC in other sectors into liberalizations of agricultural trade.

That is, the analysis suggests that the compensation schemes in both the United States and the EC that are focused on those with the highest political weights (table 1) appears feasible. Therefore, the possibility of attaining a GATT agreement is greatly increased if budget savings from partial trade liberalization for both the United States and the EC are redirected toward the economic losers with the highest political weights. The refocusing of the budget savings toward those economic losers with the highest political weights will likely reduce the need to link US/EC negotiations on agricultural policy to trade liberalization by the rest of the OECD countries or to non-agricultural areas that are also subjects of GATT negotiations. Compensating payments thus helps the US/EC negotiations to be de-linked from other concerns.

The other important result is that both the US and the EC gain from liberalization in the rest of OECD. This strengthens the notions that negotiations need to be a multilateral process.

APPENDIX: THE CONCEPTUAL MODEL

The intuition behind the conceptual model is captured in the following story. Agricultural policy in the US and the EC has two parts, goals and tools, which are determined in the political economies of the US and the EC. The political economy of a country also decides the relative rankings of goals. Each year the governments of the US and the EC independently choose from their policy tools to achieve the goals of agricultural policy given the policies of the other. When goals are at odds, tradeoffs occur according to the relative importance of each goal. The result is the best political compromise possible within each country. The conceptual model presented below is a mathematical formulation of this basic intuition.

Policy Goals

Let the agricultural policy goals of a country be summarized by the indirect profit functions of six producer groups, P_j, j = g (grains), f (animal feeds), b (beef), p (pork and poultry), m (milk), and s (sugar); by consumer welfare in consumer surplus (C); and by the welfare of taxpayers and other governmental concerns through the net position of the agricultural budget (B). The relative ranking of goals and the ordering of compromises is captured in the following function:

$$V = w_g P_g + w_o P_o + w_f P_f + w_b P_b + w_p P_p + w_m P_m + w_s P_s + w_c C + B,$$

where w_j is the weight given to the achievement of a goal (the weight given to the budget being one). A greater weight and a higher value of V imply higher rank among and a better political compromise between conflicting agricultural policy goals, respectively.

Policy Tools

Let the policy tools of both governments be domestic consumer and producer prices, tariffs, and quotas. The action space of each government, A_i i = us, ec, is the range over which these tools can vary. An action, a_i, stipulates a level for every tool. Any pair of actions for the US and the

EC, (a_{us}, a_{ec}), determine production and consumption levels in the US, the EC, and the rest of the world. As a consequence world prices, trade flows and the welfare levels of the interest groups of V for the US and the EC. Adding the subscript i and the denoting the "other" country with the subscript -i, rewrite V as

$$V_i(a_i,a_{-i}) = \Sigma_j\, w_{ji}P_{ji}(a_i,a_{-i}) + w_{ci}C_i(a_i,a_{-i}) + B_i(a_i,a_{-i}),$$

where J is the set of producer groups.

Each government obtains the best political compromise given the action of the other government by choosing an action, a_i^*, from its action space such that $V_i(a_i^*,a_{-i}) \geq V_i(a_i,a_{-i})$ for all $a_i \in A_i$. Furthermore, government i's expectation of a_{-i} is realized so that one observes a pair of actions, $a_{us}^*, a_{ec}^*)$, such that $V_{us}(a_{us}^*,a_{ec}^*) \geq V_{us}(a_{us},a_{ec}^*)$ for all $a_{us} \in A_{us}$ and $V_{ec}(a_{ec}^*,a_{us}) \geq V_{ec}(a_{ec},a_{us}^*)$ for all $a_{ec} \in A_{ec}$.

A Differentiable Case

Assume governments choose tariffs and domestic prices consistently so that domestic prices differ from world prices by the amount of the tariff. Thus, governments choose domestic prices and tariffs are determined implicitly, or governments choose tariffs and domestic prices are determined implicitly. Assume governments choose domestic consumer prices through a price index. Then the action space is composed of six producer prices and one consumer price.

If V_i is strictly concave and continuously differentiable over A_i, the first order sufficient conditions for an interior maximum are

$$\frac{\partial V_i^*}{\partial a_{ki}} = \Sigma_j\, w_j \frac{\partial p_{ji}^*}{\partial a_{ki}} + w_{ci}\frac{\partial C_i^*}{\partial a_{ki}} + \frac{\partial D_i^*}{\partial a_{ki}} = 0 \;;\; \forall k \in J,\ i = us,\ ec;$$

where * denotes (a_{us}^*,a_{ec}^*) which solve the first order sufficient conditions and which are the best political compromises. If government actions led to the best political compromises, then so do the actions observed in 1986.

Estimation of Rankings

The estimation of the ranking and of V for the US and the EC uses the first order sufficient conditions above. The partial derivatives of P_j, C, and B are estimated using a partial equilibrium, world trade model calibrated for 1986. Using the approximations of the partials, the first order sufficient conditions for a maximum represent eight equations in eight unknowns, therefore if the matrix, $\begin{bmatrix} \frac{\partial P_i}{\partial a_i} & \frac{\partial C_i}{\partial a_i} & \frac{\partial B_i}{\partial a_i} \end{bmatrix}_{8x8}$, has an inverse, the welfare weights implicit in the first order conditions are uniquely - $\begin{bmatrix} \frac{\partial P_i}{\partial a_i} & \frac{\partial C_i}{\partial a_i} & \frac{\partial B_i}{\partial a_i} \end{bmatrix}^{-1} \begin{bmatrix} \frac{\partial B_i}{\partial a_i} \end{bmatrix}$

Table 1 in the main text presents these estimates.

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